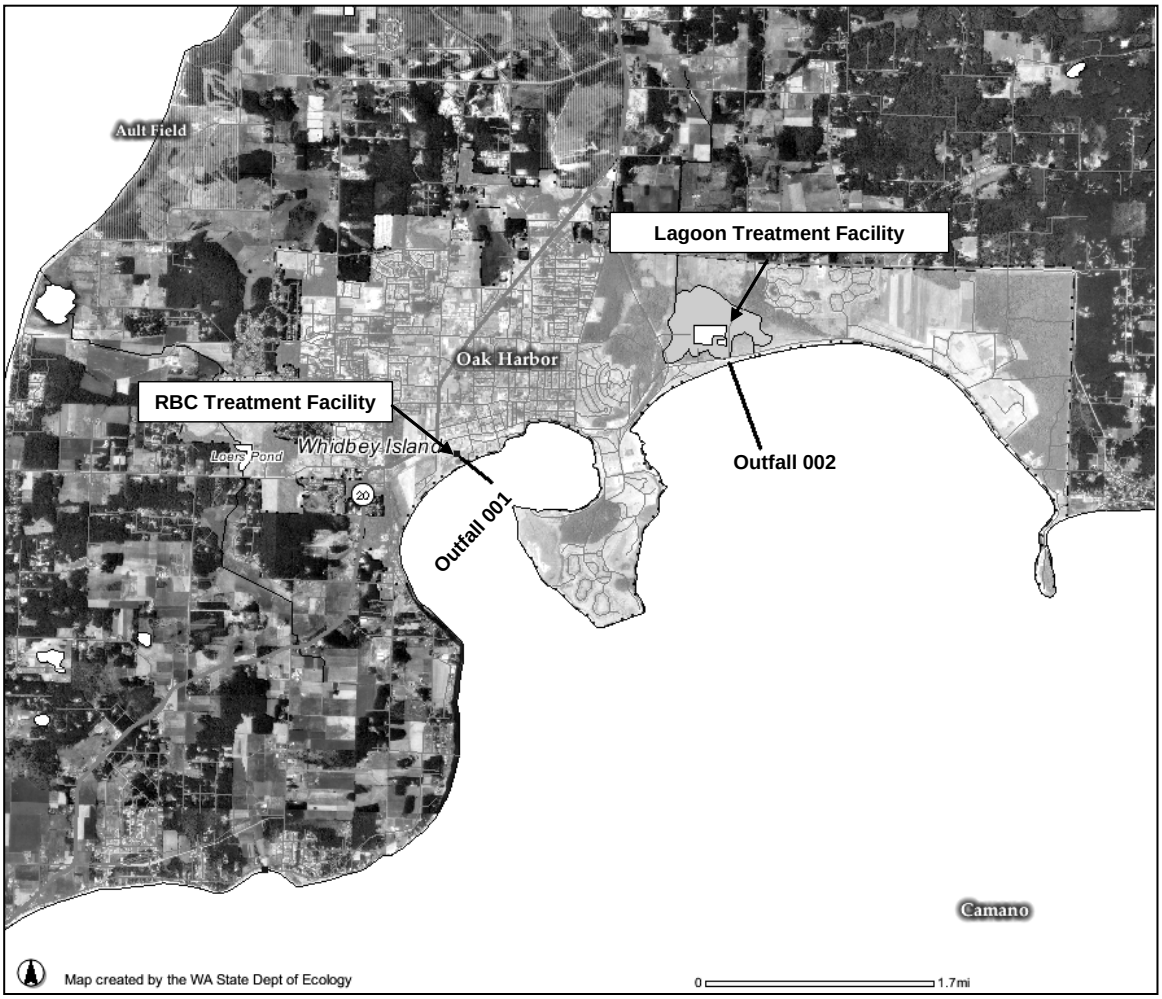
FACT SHEET FOR NPDES PERMIT WA-002056-7
OAK HARBOR WASTEWATER TREATMENT PLANTS



SUMMARY

This fact sheet is a companion document to the National Pollutant Discharge Elimination System (NPDES) Permit for the Oak Harbor Wastewater Treatment Plants (WWTP). The fact sheet explains the nature of the proposed discharges, the Department of Ecology's (the Department's) decisions on limiting the pollutants in the wastewater, and the regulatory and technical basis for those decisions. The fact sheet and permit are available for review (see Appendix A--Public Involvement for more detail on the public notice procedures).

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GENERAL INFORMATION	
Applicant	City of Oak Harbor 865 - SE Barrington Drive Oak Harbor, Washington 98277
Facility Name and Address	Oak Harbor Wastewater Treatment Plant (RBC) - Discharge 001 1501 SE City Beach Street Oak Harbor, WA 98277 Oak Harbor Seaplane Lagoon - Discharge 002 60 East Pioneer Avenue Oak Harbor, WA 98277
Responsible Official	Patty Cohen, Mayor Phone: (360) 679-5551
Type of Treatment	Rotating Biological Contactor (Secondary Treatment) - Discharge 001 Aerated facultative lagoon with Anaerobic Pretreatment Cell (Secondary Treatment) - Discharge 002
Discharge Location	RBC: Oak Harbor, Class A Marine Water Body ID: WA-06-0010 Latitude: 48° 16' 59" N Longitude: 122° 38' 51" W Lagoon: Crescent Harbor, Class A Marine Water Body ID: WA-06-0010 Latitude: 48° 17' 18" N Longitude: 122° 36' 17" W
Plant Contact	Bob Jarski, Operations Manager Phone: (360) 679-6302 Rob Kelley, Lead Operator Phone: (360) 679-5551, ext. 233

INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the Wastewater Discharge Permit Program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty (30) days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A—Public Involvement of the fact sheet for more detail on the public notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D—Response to Comments.

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

HISTORY

The City of Oak Harbor operates two interconnected wastewater treatment plants; a rotating biological contactor (RBC) plant located adjacent to the Oak Harbor City Beach Park and a multi-celled sewage lagoon.

RBC facility: The RBC plant was built in 1978 as an upgrade to a pre-existing primary plant. Parts of the primary plant, including the primary clarifiers, were incorporated into the secondary design. The facility had some problems during the early years of operation, including an RBC shaft failure. To address this and other problems, various modifications have been made to the plant.

In late 1985, BOD loadings to the RBC plant suddenly increased, impacting performance. A plant evaluation revealed that influent greases were unusually high and were causing problems. In 1994, the City passed a grease trap ordinance and began a rigorous inspection and enforcement program. As a result commercial establishments, especially restaurants, reduced grease and associated BOD loadings significantly, resulting in improvements to treatment plant performance.

In 1995 and 1996, the City received approval of an engineering report addendum which recommended an increase to the approved design loading criteria for BOD for the RBC plant, from 1200 pounds per day (ppd) to 1500 ppd. These ratings were reassessed in 2004 with the issuance of an additional addendum engineering report. This report evaluated operating data from January 1998 to April 2004 to support claims that the RBC facility could be effectively operated at loading rates up to 2000 ppd. The findings of this report were approved in December 2004, thus increasing the approved loading rate to 2000 ppd.

In August of 1997, a new sludge thickener was added to the RBC plant, resolving an old problem associated with the handling of sludge removed from the primary and secondary clarifiers.

Lagoon Facility: The sewage lagoon system was previously operated by Naval Air Station Whidbey (NAS), to serve the seaplane base housing areas. Under a 50-year lease agreement, the City of Oak Harbor now operates and maintains the lagoon plant to serve both the NAS facilities and part of the City. By means of a flow diversion pump station, force mains and siphon constructed in 1991, wastewater flows in excess of the 0.7 MGD (maximum monthly average) design flow of the RBC plant are now transferred to the sewage lagoon system. As part of the lease agreement, the City deepened and lined the lagoons in 1990-91, constructed new disinfection facilities and extended the outfall. The Lagoon Facility currently has an approved maximum monthly average design flow of 2.5 MGD (*2004 Oak Harbor Seaplane WWTP Improvement: Addendum to the 1987 Engineering Report, Sear-Brown*).

In 2003, several tears were discovered in the lining of the NW lagoon cell, prompting the need for emergency repair and reevaluation of the lagoon system's treatment capabilities. Plans and specifications for modifying the NW lagoon cell to include an anaerobic pretreatment cell were submitted to the Department in April 2004. Construction of the anaerobic cell occurred later that year and the modified system was brought online in December 2004. The modified system retained the existing hydraulic capacity of the original system and increased the system's ability to remove suspended solids, BOD and nutrients.

COLLECTION SYSTEM STATUS

The City prepared a draft Comprehensive Sewerage Plan (CSP) dated April 1997, which addresses the condition of the City's sewage collection system. One general conclusion in the plan is that infiltration and inflow is not excessive overall, although it is high in portions of the system. Because of some surcharging of sewer lines in portions of the system, the CSP recommends replacement of some undersized lines. In 1997-98, the City of Oak Harbor upgraded several sections of sewer main according to the CSP recommendations. Sewer mains on Whidbey Avenue, Ely Street, SE Barrington Drive, and SE City Beach Street were upgraded. Also, the City annually monitors sewerage flow of mains in the growth areas as identified in the CSP.

At present, the collection system consists of approximately 65 miles of gravity pipe and 5 miles force mains. Of the 65 miles of gravity sewer, there is approximately 26 miles of PVC pipe construction, with the rest being of clay, concrete & reinforced concrete pipe. The city has ten remote sewage pumping stations located throughout the city, varying in size from 3-Hp to 30-Hp. Each of the pumping stations has connections for portable generator hookups and nine stations have automated alarm systems for high level detection and power outages. The city has one portable generator and one six-inch by-pass pump.

Operation and maintenance of the collection system is performed by city staff who utilizes a jetting/vactor truck, sewer television monitoring equipment, and manhole grouting equipment. The entire sewer system gets cleaned every three to five years, with some areas getting cleaned every six months. All newly constructed sewers get televised before acceptance and existing older lines get televised when problems are suspected or when new service connections are made to them.

The City is preparing to commission a Comprehensive Sewerage Plan, which will likely be completed sometime in 2005.

SIGNIFICANT INDUSTRIAL USERS

The City currently has only one significant industrial user: The United States Naval Air Station Whidbey Island (State Waste Discharge Permit #ST-7398). The Navy's operations at NAS Whidbey result in discharges from six separate connections. Other businesses in the city are regulated by municipal codes prohibiting the discharge of fats, oils and grease (FOG) into the treatment system. The presence of FOG in the treatment system had historically contributed to poor performance of the RBC facility. Strict enforcement of FOG ordinances has corrected those problems.

TREATMENT PROCESSES

The RBC facility (Discharge # 001) consists of bar screens, a grit chamber, influent pump station, primary clarification, rotating biological contactors, secondary clarification, disinfection with chlorine, dechlorination with Captor (calcium sulfate) and an effluent pump station used for certain tide stages. The current configuration of the RBC plant is shown in Appendix E for Discharge # 001. Flows in excess of 0.7 MGD are diverted to the Seaplane Lagoon by means of a diversion pump station and force main.

The sewage lagoon treatment facility (Discharge # 002) consists of the diversion pump station and force main, influent flow measurement with a parshall flume, macerators, an anaerobic pretreatment lagoon, three aerated lagoons, disinfection with chlorine, and an effluent pump station for discharge at high tides. This facility also includes a diversion structure to allow effluent polishing in a physical-chemical treatment system. The physical chemical system includes two flash mix basins, two flocculation basins, and two rectangular clarifiers. The system is capable of feeding both ferric sulfate and polymer. The tertiary plant is capable of handling 0.885 mgd average flow, while the lagoons have a maximum month average design flow of 2.5 mgd. Space is available to construct a fourth lagoon cell as needed for expansion.

A project was completed in 2002 to dredge solids from the NW lagoon. Following the dredging project, tears were discovered in the NW lagoon lining, prompting the need for emergency lining repair. In 2004, the NW lagoon was divided and approximately one-third of the volume at the head of the cell was converted to a covered anaerobic pretreatment cell. This cell was developed as a means to mitigate historic problems with the buildup of solids in the system. Filling of the anaerobic cell commenced early in December 2004 and is expected to achieve stable operation by the spring of 2005. The current layout of the Lagoon Facility can also be found in Appendix E.

DISCHARGE OUTFALLS

Disinfected secondary effluent from the RBC plant is discharged through Outfall #001, a 1160-foot long discharge line that terminates at -15 feet mean lower low water (MLLW). The 18" corrugated metal outfall has a diffuser section consisting of five 8-inch ports arranged in a modified "H" pattern and a single 6-inch port. The 6-inch port is oriented as an opening in the top center of the diffuser. Four 8-inch ports equally-spaced on 7-foot centers (two on each side of the diffuser) discharge horizontally and are oriented around the top 6-inch port. The sixth port discharges at the end of the pipe.

A 2001 inspection of Outfall #001 revealed that only the center 6-inch and end 8-inch port were open and accessible for wastewater flow. The four horizontal 8-inch ports were blocked by sediment buildup at the openings. The sediment buildup is suspected to be the result of lower than design flow volumes which result in velocities inadequate for flushing. At present, the City has no plans for clearing sediment from the obstructed ports and will continue to operate the outfall as a two-port diffuser. This plan will allow for a slight improvement in effluent dispersion since increased flow velocities from the remaining ports will increase localized mixing currents near the outfall.

Disinfected secondary effluent from the Lagoon is discharged to Outfall 002 via a 3,284-foot 18-inch outfall. The 184-ft long diffuser section consists of twenty-four 2¼" ports spaced alternately on 8-foot centers. The diffuser ports discharge horizontally at the center of the spring line of the diffuser, which terminates at -44 feet MLLW. Diagrams of both of the outfall diffuser sections, together with their allowed mixing zones, are shown in Appendix H.

RESIDUAL SOLIDS

Residual solids generated at the RBC plant consist of screenings, grit, sludge, and scum. Screenings and grit are disposed of at the Island County Landfill. The remaining solids are processed through one primary anaerobic digester and two secondary digesters. Excess or waste digested sludge from the primary digester is pumped to the secondary digesters for further stabilization. Approximately 3,000 gpd of sludge from the secondary digesters is transferred to the diversion pump station and mixed with raw influent wastewater sent to the Seaplane Lagoon Facility. Once in the lagoon, the RBC sludge co-settles with the lagoon solids. Approximately 45 dry tons per year of biosolids is sent from the RBC plant to the Lagoon Facility.

At the Seaplane Lagoon Facility, the diversion pump station contains a mechanical bar screen which generates screenings. These screenings are disposed of at the Island County Landfill. Solids from the Capehart Housing Facility influent line are ground in the macerators at the lagoon headworks and retained in the anaerobic pretreatment cell. Chemical sludge and any scum generated by operation of the tertiary treatment facility are returned to the headworks. Solids levels in the lagoon cells are monitored annually. Most recent biosolids removal projects were conducted in 2002 and 2005. Purged biosolids were dewatered and trucked to Boulder Park, Inc. in eastern Washington for beneficial use as soils enhancement.

PERMIT STATUS

The previous permit for this facility was issued on July 17, 2000. Separate effluent limitations were placed on Total Suspended Solids (TSS), pH, Fecal Coliform bacteria, and total residual chlorine for each of the two treatment facilities. Limitations for biochemical oxygen-demand were issued as 5-day Biochemical Oxygen Demand (BOD_5) limits for the RBC facility and carbonaceous biochemical oxygen demand (CBOD) for the Lagoon Facility. The city has since requested that future permits for both facilities be issued limits on carbonaceous biochemical oxygen demand in lieu of BOD_5.

An application for permit renewal was submitted to the Department on December 29, 2003, and accepted on March 1, 2004.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The following table is a summary of monitoring violations and warnings that the facilities have experienced over the course of their last permit term.

Table 1: Summary of Oak Harbor Violations and Warnings

RBC Plant

Date	Type	Parameter	Reported Value	Units	Permit Limit	Units	Percent of Capacity
8/1/2000	Capacity Warning	FLOW, Month Average	0.624	MGD	0.7	MGD	89%
8/1/2000	Capacity Warning	Influent BOD_5, Month Average	1,400	lb/day	1,500	lb/day	93%
10/1/2000	Capacity Warning	Influent BOD_5, Month Average	1,436	lb/day	1,500	lb/day	96%
2/1/2001	Capacity Warning	Influent BOD_5, Month Average	1,341	lb/day	1,500	lb/day	89%
11/1/2002	Capacity Warning	Influent BOD_5, Month Average	1,350	lb/day	1,500	lb/day	90%
12/1/2002	Capacity Warning	Influent BOD_5, Month Average	2,083	lb/day	1,500	lb/day	139%
7/1/2003	Capacity Warning	Influent BOD_5, Month Average	1,647	lb/day	1,500	lb/day	110%
8/1/2003	Capacity Warning	Influent BOD_5, Month Average	1,309	lb/day	1,500	lb/day	87%
9/1/2003	Capacity Warning	Influent BOD_5, Month Average	1,351	lb/day	1,500	lb/day	90%
10/1/2003	Capacity Warning	Influent BOD_5, Month Average	1,455	lb/day	1,500	lb/day	97%
8/1/2004	Capacity Warning	Influent BOD_5, Month Average	1,452	lb/day	1,500	lb/day	97%

Lagoon Facility

Date	Type	Parameter	Reported Value	Units	Permit Limit	Units	Percent of capacity
8/1/2002	Capacity Warning	Influent Total Suspended Solids, Month Average	4,432	lb/day	3,750	lb/day	118%
9/1/2002	Capacity Warning	Influent Total Suspended Solids, Month Average	4,843	lb/day	3,750	lb/day	129%
5/1/2004	Capacity Warning	Influent Total Suspended Solids, Month Average	3,316	lb/day	3,750	lb/day	88%
6/1/2004	Capacity Warning	Influent Total Suspended Solids, Month Average	3,543	lb/day	3,750	lb/day	94%
11/1/2004	Capacity Warning	Influent BOD5, Month Average	3,984	lb/day	4,200	lb/day	95%
11/1/2004	Capacity Warning	Influent Total Suspended Solids, Month Average	3,368	lb/day	3,750	lb/day	90%

During the history of the previous permit, the Permittee has remained in compliance with discharge standards, based on Discharge Monitoring Reports (DMRs) submitted to the Department and inspections conducted by the Department. Both facilities have exceeded 85% of their rated capacities for flow, BOD_5 or Total Suspended Solids during the term of their last permit. However, the recent approval of a capacity increase of the RBC facility and commissioning of an anaerobic pre-treatment cell at the Lagoon Facility has addressed these capacity issues for the near future. Complete data from the DMRs submitted for each facility can be found in Appendix F (Discharge 001) and Appendix G (Discharge 002).

The facilities received their last inspection on December 19, 2002. This inspection was a Class I, non-sampling inspection, conducted by the NPDES permit manager for the facilities and the Department's technical assistance specialist. Both facilities were evaluated to be operated and maintained in good condition with no compliance-related areas of concern.

No questions or concerns have been raised with regard to lab practices and accreditation for the facilities.

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in an NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent**.** Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation**.** Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances, the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria. Approved design criteria for the RBC Plant, taken from the *2004 RBC Wastewater Treatment Plant Capacity Analysis: An Addendum to the Engineering Report for the Upgrade of Secondary Treatment Facilities; NAS/Seaplane Base, June 1987* (URS), are as follows:

Table 1a: Design Standards for the RBC treatment facility (Discharge #001).

Parameter	Design Quantity
Treatment method	Rotating Biological Contactor with primary and secondary clarifiers
Monthly average dry weather flow	0.7 MGD
BOD_5 influent loading	2,000 lb./day

Criteria for the Seaplane Lagoon Facility, taken from the *2004 Oak Harbor Seaplane WWTP Improvement: Addendum to the 1987 Engineering Report* (Sear-Brown), are as follows:

Table 1b: Design Standards for the Seaplane Lagoon treatment facility (Discharge #002).

Parameter	Design Quantity
Treatment method	Aerobic facultative lagoon with anaerobic pretreatment
Monthly average dry weather flow	2.5 MGD
BOD_5 influent loading	4,580 lb./day
TSS influent loading	5,130 lb./day

TECHNOLOGY-BASED EFFLUENT LIMITATIONS, RBC FACILITY

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (federal) and in Chapter 173-221 WAC (state). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The following technology-based limits for pH, fecal coliform, BOD_5, and TSS are taken from Chapter 173-221 WAC are as follows:

Table 2a: Technology-based Limits for the RBC Facility (Discharge #001).

Parameter	Limit
pH:	shall be within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
$CBOD_5$ (concentration)	Average Monthly Limit is the most stringent of the following: - 25 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 40 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
Chlorine	Average Monthly Limit = 0.5 mg/L Average Weekly Limit = 0.75 mg/L

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173221-030(11)(b). Monthly effluent mass loadings for $CBOD_5$ and TSS (lbs/day) were calculated as:

$CBOD_5$ Average design flow (0.7 MGD) x concentration limit (25 mg/L) x 8.34 (conversion factor) = mass limit 146 lb./day.

Weekly average effluent mass loading = 0.7 MGD x 40 mg/L x 8.34 = 233 lb./day.

TSS Average design flow (0.7 MGD) x concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 175 lb./day.

Weekly average effluent mass loading = 1.5 X monthly loading = 263 lbs/day.

The general technology-based monthly average limitation for chlorine is derived from standard operating practices. The Water Pollution Control Federation's Chlorination of Wastewater (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/liter chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/liter chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/liter. The existing permit has a water quality-based chlorine limit of 0.114 mg/L (average monthly) and 0.30 mg/L (maximum daily), which the RBC facility has demonstrated an ability to achieve. In accordance with WAC 173-220-130, the proposed permit may include this limit that has been demonstrated as achievable as a technology based limit.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS, SEAPLANE LAGOON FACILITY

Alternative discharge standards are allowed by WAC 173-221-050(2) for facilities using stabilization ponds or lagoons for municipal wastewater treatment. The alternative standard allows higher limits to be set for both $CBOD_5$ and TSS. For $CBOD_5$, the previous permit included a more stringent limit of 25 mg/L (monthly)/40mg/L (weekly), which was demonstrated to be achievable by the facility. Therefore, this more stringent limit will remain. For TSS, the alternative standard allows for a limit that is demonstrated to be achievable by the general class of stabilization pond treatment systems (currently 75 mg/L monthly, 110 mg/L weekly). This alternative standard will remain in effect for the Lagoon Facility. Technology-based limits for the Lagoon Facility are as follows:

Table 2b: Technology-based Limits for the Seaplane Lagoon Facility (Discharge #002).

Parameter	Limit
pH:	shall be within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
$CBOD_5$ (concentration)	Average Monthly Limit is the most stringent of the following: - 25 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 40 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 75 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 110 mg/L
Chlorine	Average Monthly Limit = 0.5 mg/L Average Weekly Limit = 0.75 mg/L

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). Monthly effluent mass loadings for $CBOD_5$ and TSS (lbs/day) were calculated as:

$CBOD_5$ Average design flow (2.5 MGD) x concentration limit (25 mg/L) x 8.34 (conversion factor) = mass limit 521 lb./day.

Weekly average effluent mass loading = 2.5 MGD x 40 mg/L x 8.34 = 834 lb./day.

TSS Average design flow (2.5 MGD) x Concentration limit (75 mg/L) x 8.34 (conversion factor) = mass limit 1564 lb./day.

Weekly average effluent mass loading = 1.5 X monthly loading = 2346 lbs/day.

Chlorine technology-based limits are based on the general criteria for disinfection as was discussed for the RBC Plant.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established surface water quality standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the water quality standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The state was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other diseases and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

NARRATIVE CRITERIA

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair

aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington.

ANTIDEGRADATION

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if ambient water quality is either higher or lower than the designated classification criteria given in Chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic waterbody uses.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. The effluent is characterized as follows:

Table 3: Average Wastewater Characteristics

Parameter	Value (RBC, #001)	Value (Lagoon, #002)
Flow (MGD)	0.501	1.29
pH (standard units)	6.9 – 7.4	7.0 – 8.6
Fecal Coliform (#/100ml)	9	5
Winter Temperature (°C)	15.0	7.8
Summer Temperature (°C)	20.7	17.5
Biochemical Oxygen Demand (mg/L)	15	19
Total Suspended Solids (mg/L)	8	19

DESCRIPTION OF THE RECEIVING WATER

The RBC facility (Discharge #001) discharges to Oak Harbor and the Seaplane Lagoon Facility (Discharge #002) discharges to Crescent Harbor. Both water bodies are designated as Class A receiving waters in the vicinities of the outfalls. There are no other known significant point or nonpoint sources of pollutants within about four miles of these outfalls. Characteristic uses include the following:

Class A (Excellent) Marine: Salmonid and other fish migration, rearing and spawning; clam, oyster and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Fecal Coliforms	14 organisms/100 mL maximum geometric mean
Dissolved Oxygen	6.0 mg/L minimum
Temperature	16 degrees Celsius maximum or incremental increases above background
pH	7.0 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix J for numeric criteria for toxics of concern for these discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A-400 WAC and are defined as follows:

> "In estuaries, mixing zones, singularly or in combination with other mixing zones, shall not extend in any horizontal direction from the discharge port(s) for a distance greater than two hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water; and not occupy greater than twenty-five percent of the width of the water body as measured during mean lower low water. For the purpose of this section, areas to the east of a line from Green Point (Fidalgo Island) to Lawrence Point (Orcas Island) are considered estuarine, as are all of the Strait of Georgia and the San Juan Islands north of Orcas Island. To the east of Deception Pass, and to the south and east of Admiralty Head, and south of Point Wilson on the Quimper Peninsula, is Puget Sound proper, which is considered to be entirely estuarine. All waters existing within bays from Point Wilson westward to Cape Flattery and south to the North Jetty of the Columbia River shall also be categorized as estuarine."
>
> In addition, "In oceanic and estuarine waters a zone where acute criteria may be exceeded shall not extend beyond ten percent of the distance established (for maximum mixing zone size) as measured independently from the discharge port(s)."

Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants—their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

In January 1995, URS Consultants prepared a Mixing Zone Study for the City of Oak Harbor. This study gathered basic oceanographic data in the vicinities of the two outfalls and included computer modeling analyses using the EPA Plumes CORMIX model. Additionally, dye studies were conducted at the RBC (Discharge #001) outfall.

The dye studies were inconclusive, as concentration levels were found much higher in the receiving waters than in the full-strength discharge. It is thought that the study was flawed in using too low of dye dosing concentrations, and that natural background fluorescence may have interfered with the results.

The computer model runs presented in the study were incomplete, as they were not configured to calculate both near-field and far-field dilutions. However, there was sufficient information for a complete analysis with near-field and far-field calculations in preparation of the most recent permit.

Dilution factors for both outfalls were reevaluated with EPA's Visual Plumes software using UM3 (three-dimensional Updated Merge Model) protocols. Ambient conditions reported in the 1995 URS Mixing Zone Study, and effluent discharge rates reported in the NPDES application were used to evaluate both outfalls. Evaluation of the RBC outfall was based on a synthetic "theoretical" diffuser configuration that approximates the 2-port configuration resulting from blockages reported in the 2001 outfall evaluation. Rationale used in developing this synthetic diffuser can be found in Appendix H.

Results of the evaluation using Visual Plumes can be also found in Appendix H for both the RBC outfall and the lagoon outfall. Use of the updated modeling software did not result in substantial changes to the dilution factors. However the change in the RBC Outfall's configuration resulted in improved data reliability. The model also predicted that critical conditions for the lagoon outfall will occur during the winter rather than summer, which was predicted by the earlier CORMIX model. Critical conditions identified by the mode for each outfall are as follows:

> RBC Plant (# 001) - Use winter oceanographic conditions with design flow (0.7 mgd) for chronic analysis, and maximum month record flow (1.9 mgd) for acute analysis. Use low receiving water currents.

Lagoon Plant (# 002) - Use winter oceanographic conditions with design flow (2.5 mgd) for chronic analysis, and maximum day flow (3.2 mgd) for acute analysis. Use low receiving water currents.

Other conditions were assessed, but those listed above appeared to be the worst case for dilution. The resulting dilutions from the computer models are shown below.

Table 4: Mixing zone dilution ratios.

Facility	Chronic Dilution	Acute Dilution
RBC Plant (# 001)	50:1	19:1
Lagoon Plant (# 002)	138:1	97:1

The dilution factors are much higher for the lagoon outfall than for the RBC plant. This is because the lagoon discharge is better situated (much further from shore and in deeper water) and is better designed (longer diffuser section with more ports). The RBC outfall (# 001) is located in confined waters. In fact, the size of the allowed dilution zone had to be reduced to occupy no more than 25% of the width of the receiving water per WAC 173-201A-100 (7)(b)(ii). A detailed discussion of dilution zone size determinations is given in Appendix H for the RBC outfall. The allowed chronic mixing zones and zones of acute criteria exceedance are shown graphically for the two outfalls in Condition S1.C of the permit.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water. The critical condition for Oak Harbor and Crescent Harbor that were used in developing outfall evaluations are found in Appendix H. No data are available to establish background concentrations of any toxic pollutants listed in the NPDES application. The impacts of dissolved oxygen deficiency, temperature, pH, fecal coliform, chlorine, ammonia, metals, and other toxics were determined as shown below, using the dilution factors described above.

BOD_5--Under critical conditions, there is no predicted violation of the water quality standards for surface waters. Therefore, the technology-based effluent limitation for BOD_5 was placed in the permit.

Temperature--The impact of the discharge on the temperature of the receiving water was modeled by simple mixing analysis at critical condition. For the RBC outfall (#001) the receiving water temperature at the critical condition is 9.24^{o} C and the maximum effluent temperature is 15.0^{o} C. The predicted resultant temperature at the boundary of the chronic mixing zone is 9.36^{o} C and the incremental rise is 0.12^{o} C. For the lagoon outfall (#002) the receiving water temperature at the critical condition is 9.57^{o} C and the maximum effluent temperature is 11.60^{o} C. The predicted resultant temperature at the boundary of the chronic mixing zone is 9.58^{o} C and the incremental rise is 0.01^{o} C.

Under critical conditions, there is no predicted violation of the water quality standards for surface waters. Therefore, no effluent limitation for temperature was placed in the proposed permit.

pH--Because of the high buffering capacity of marine water, compliance with the technology-based limits of 6 to 9 will assure compliance with the water quality standards for surface waters.

Fecal Coliform--The numbers of fecal coliform were modeled by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and dilution factors of 50 and 138 for the RBC and lagoon plants, respectively. Under critical conditions there is no predicted violation of the water quality standards for surface Waters with the technology-based limit. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the water quality standards for surface waters or from having surface water quality-based effluent limits. Chemicals of concern detected in the effluent of each facility are listed in the following table.

Table 5: Toxics Identified in Effluent.

RBC Facility

Compound	Concentration Reported		Number of Samples
	Maximum	Average	
Ammonia (mg/L as N)	34.8	26.8	38
Chlorine, total residual (mg/L)	0.17	0.02	7

Lagoon

Compound	Concentration Reported		Number of Samples
	Maximum	Average	
Ammonia (mg/L as N)	55.9	34.46	38
Chlorine, total residual (mg/L)	0.71	0.28	7
Copper (mg/L)	0.021	0.0143	3
Zinc (mg/L)	0.05	0.0383	3
Bis(2-ethylhexyl)phthalate (µg/L)	9.5		3
Acetone (µg/L)	5		3
Methylene Chloride (µg/L)	3.6		3
Chloroform (µg/L)	1		3
Methyl ethyl Ketone (µg/L)	3.9		3
Nitrate/Nitrite (mg/L as N)	2.8	1.97	3

Appendix I lists the toxics data for heavy metals which have been detected in both the RBC plant (Discharge #001) and the lagoon (Discharge #002) discharges during the past five years. Additionally ammonia and chlorine are present in both discharges. Monthly monitoring data for ammonia and chlorine are given in Appendix F (RBC Plant) and Appendix G (Lagoon Facility) together with other effluent data.

Note: Although no testing data on metals and priority pollutants were required for the RBC facility, a reasonable assumption can be made that compounds identified in the Lagoon Facility effluent may be present in the RBC effluent. This is because both facilities treat waste from a common collection system. Therefore, concentrations of priority pollutants and metals found in the Lagoon effluent were included in the RBC facility's analysis of reasonable potential to exceed water quality standards.

Water quality criteria for metals in Chapter 173-201A WAC are based on the dissolved fraction of the metal. The Permittee may provide data clearly demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Metals criteria may be adjusted on a site-specific basis when data is available clearly demonstrating the seasonal partitioning in the ambient water in relation to an effluent discharge.

Metals criteria may also be adjusted using the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced.

No valid ambient background data was available for the pollutants listed in Table 5. Therefore, a determination of reasonable potential to exceed water quality standards was conducted using zero for background concentrations. This analysis resulted in no reasonable potential for either discharge to exceed water quality standards for all substances except chlorine.

CHLORINE LIMITS

Using the data listed in Table 5, together with the appropriate dilution factors determined earlier, a reasonable potential analysis was conducted for each discharge to determine whether or not effluent limitations would be required in this permit. As detailed in Appendix J, only chlorine was found to have a reasonable potential to violate water quality standards, thus requiring specific permit limitations for both discharges.

Water quality-based permit limits were calculated for chlorine in the two discharges. For the lagoon plant (Discharge #002), the water quality-based limits are less restrictive than the technology-based limits discussed earlier, thus the technology-based limits of 0.5 mg/L monthly average and 0.75 mg/L daily maximum will be utilized in the permit.

For the RBC plant (Discharge #001) the water quality-based limits for chlorine that were determined from a reasonable potential analysis using revised dilution factors are less restrictive than the water quality-based limits of 0.114 mg/L monthly average, which were present in the last permit. However the water quality-based limit is more restrictive than the technology-based limit of 0.30 mg/L daily maximum. Therefore, the previous water quality-based monthly maximum limit and the revised water quality-based daily maximum limit will be used for the RBC plant. A comparison of the limits is shown in Table 6.

Table 6 - Chlorine limits:

	Technology-based Limit	Water quality-based Limit
RBC plant (# 001)		
Max. month average	0.5 mg/L	0.114 mg/L*
Max daily limit	0.75 mg/L	0.26 mg/L *
Lagoon (# 002)		
Max. month average	0.5 mg/L *	0.63 mg/L
Max daily limit	0.75 mg/L *	1.26 mg/L

* Most restrictive criteria, which will be used in permit

WHOLE EFFLUENT TOXICITY

The water quality standards for surface waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests are providing an indication of the potential lethal effect of the effluent to organisms in the receiving environment.

Chronic toxicity tests measure various sublethal toxic responses such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test of an organism with an extremely short life cycle or a partial life cycle test on a critical stage of one of a test organism's life cycles. Organism survival is also measured in some chronic toxicity tests.

Accredited WET testing laboratories have the proper WET testing protocols, data requirements, and reporting format. Accredited laboratories are knowledgeable about WET testing and capable of calculating an NOEC, LC_{50}, EC_{50}, $IC_{25,}$ etc. All accredited labs have been provided the most recent version of the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* which is referenced in the permit. Any Permittee interested in receiving a copy of this publication may call the Ecology Publications Distribution Center at (360) 407-7472 for a copy. Ecology recommends that Permittees send a copy of the acute or chronic toxicity sections(s) of their permits to their laboratory of choice.

Acute Toxicity: Acute toxicity was measured for Outfall #002 during effluent characterization in the previous permit term. Acute toxicity was found to be at levels that, in accordance with WAC 173-205-050(2)(a), have a reasonable potential to cause receiving water toxicity. An acute toxicity limit is therefore required. The acute toxicity limit is no statistically significant

difference in test organism survival between the acute critical effluent concentration (ACEC) and the control.

ACEC = 1/Acute Dilution Factor = 1/97 or 1.0 % of the effluent

Toxicity was not measured for Outfall #001 as it does not exceed the flow-based testing threshold of 1.0 MGD.

The acute toxicity limit is set relative to the zone of acute criteria exceedance (acute mixing zone) established in accordance with WAC 173-201A-100. The acute critical effluent concentration (ACEC) is the concentration of effluent existing at the boundary of the acute mixing zone during critical conditions

Monitoring for compliance with an acute toxicity limit is accomplished by conducting an acute toxicity test using a sample of effluent diluted to equal the ACEC and comparing test organism survival in the ACEC to survival in nontoxic control water. The Permittee is in compliance with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC and the control.

A review of the initial screening tests suggests that the positive results for toxicity may have been caused by a build up of ammonia within the test jar. The recommendation has been made by Ecology's Technical Services Unit to perform compliance testing using a carbon dioxide blanket in order to avoid the formation of toxic ammonia within the test jar. In addition, effluent samples should be taken just before chlorination. Additional information regarding WET testing procedures can be found on Ecology's web site at www.ecy.wa.gov/programs/wq/wet/, or by calling the WET Testing Program Coordinator at (360) 407-6445.

Enforcement of WET limits through compliance testing is authorized under WAC 173-205. Removal of WET limit testing is allowed by WAC 173-205-120 when the Permittee demonstrates compliance with the limit performance standards for a period of three consecutive test years or the term of the permit. Given the suspicion that characterization testing failures were the result of testing procedures, demonstrating compliance within the first three years of the permit is possible if tests are performed according to the recommendations provided by the WET Testing Program Coordinator. Therefore, the proposed permit will allow for the Permittee to request discontinuance of testing after three consecutive test years reveal no acute toxicity. However, acute WET characterization testing will still be required in the one-year period preceding the submittal of a renewal application.

Chronic: The WET tests during effluent characterization of Outfall #002 indicate that no reasonable potential exists to cause receiving water chronic toxicity. The Permittee will not be given a chronic WET limit and will only be required to retest the effluent prior to application for permit renewal in order to demonstrate that chronic toxicity has not increased in the effluent. The chronic toxicity tests shall show no statistically significant difference in test organism response between the chronic critical effluent concentration (CCEC) and the control.

CCEC = 1/Chronic Dilution Factor = 1/138 or 0.7 % of the effluent

If the Permittee makes process or material changes which, in the Department's opinion, results in an increased potential for effluent toxicity, then the Department may require additional effluent characterization in a regulatory order, by permit modification, or in the permit renewal. Toxicity is assumed to have increased if WET testing conducted for submission with a permit application fails to meet the performance standards in WAC 173-205-020, "whole effluent toxicity performance standard." The Permittee may demonstrate to the Department that changes have not increased effluent toxicity by performing additional WET testing after the time the process or material changes have been made.

HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the effluent is likely to have chemicals of concern for human health. The discharger's high priority status is based on the discharger's status as a major discharger and the reported presence of one or more of the 91 substances listed in the National Toxics Rule, according to the discharger's NPDES permit application. Compounds of concern with regard to human health include bis(2-ethylhexyl) phthalate, methylene chloride, and chloroform.

A determination of the discharge's potential to cause an exceedance of the water quality standards was conducted as required by 40 CFR 122.44(d). The reasonable potential determination was evaluated with procedures given in the Technical Support Document for Water Quality-Based Toxics Control (EPA/505/2-90-001) and the Department's *Permit Writer's Manual* (Ecology Publication 92-109, July 1994). The determination indicated that the discharge has no reasonable potential to cause a violation of water quality standards, thus an effluent limit is not warranted. This analysis is shown in Appendix K.

SEDIMENT QUALITY

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400). Sediment analysis was conducted in the vicinity of the Lagoon outfall (#002) during the past permit cycle. However no current data is available for the area around the RBC Plant outfall (#001).

The Department has determined through a review of the sediment analysis conducted near Outfall #002 that this discharge has no reasonable potential to violate the sediment management standards. Concern was expressed regarding the footprint of sulfides levels that have been documented around the outfall location. Sulfides can be very toxic in laboratory bioassays, but the relationship between total sulfides in bulk sediment measurements to porewater/overlying water sulfides in bioassays is still unknown. The Sediment Management Unit (SMU) is currently studying the impact of bulk sulfides levels at another municipal wastewater treatment location and the SMU may have future recommendations on this issue for future permits. However no further monitoring of this location is requested at this time.

Current sediment quality data is not available for the region near the RBC Plant outfall (#001). Therefore, The Department's Sediment Management Unit has requested baseline sediment monitoring be required in this permit. Compliance with this monitoring requirement will include completion of a sediment management analysis plan, which is to be approved by the Department prior to sample collection. The plan shall included target locations for sampling, method of collection and sample storage and a listing of chemicals that will be included in the analysis. The proposed chemical analysis should include the following: copper, zinc, lead, total petroleum hydrocarbons, BTEX, bis(2-ethylhexyl) phthalate, methylene chloride, and chloroform. If the analysis indicates a potential to exceed sediment quality standards, the Department will include discharge limits necessary to protect sediment quality in future permits.

GROUND WATER QUALITY LIMITATIONS

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100). This Permittee has no discharge to ground and therefore no limitations are required based on potential effects to ground water.

COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED July 17, 2000

Parameter	Existing Limit	Proposed Limit
RBC PLANT (Disch #001)		
BOD	Based on BOD_5	Based on CBOD
Month Avg., mg/L	30	25
Month Avg., ppd	175	146
Weekly Avg., mg/L	45	40
Weekly Avg., ppd	263	233
TSS		
Month Avg., mg/L	30	30
Month Avg., ppd	175	175
Weekly Avg., mg/L	45	45
Weekly Avg., ppd	263	263
Fecal Coliform		
Monthly Avg.	200/100 ml	200/100 ml
Weekly Avg.	400/100 ml	400/100 ml
pH, allowable range	6.0 - 9.0 Std Units	6.0 - 9.0 Std Units
Total Residual Chlorine		
Monthly Avg., mg/L	0.114	0.114
Monthly Avg., ppd	0.67	N/A
Daily Maximum, mg/L	0.30	0.26

Parameter	Existing Limit	Proposed Limit
LAGOON - Disch. # 002		
$CBOD_5$		
Month Avg., mg/L	25	25
Month Avg., ppd	521	521
Weekly Avg., mg/L	40	40
Weekly Avg., ppd	782	834
TSS		
Month Avg., mg/L	75	75
Month Avg., ppd	1564	1564
Weekly Avg., mg/L	110	110
Weekly Avg., ppd	2294	2294
Fecal Coliform		
Monthly Avg.	200/100 ml	200/100 ml
Weekly Avg.	400/100 ml	400/100 ml
pH, allowable range	6.0 - 9.0 Std Units	6.0 - 9.0 Std Units
Total Residual Chlorine		
Monthly Avg., mg/L	0.5	0.5
Monthly Avg., ppd	10.4	N/A
Daily Maximum, mg/L	0.75	0.75

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (July 1994) for RBC Plants with design loads between 0.5-2.0 MGD and Sewage Lagoons with design loads greater than 0.5 MGD. Minimum monitoring requirements for that classification of wastewater facilities are as follows:

Flow (MGD):	Continuous at influent or effluent
pH:	Daily final effluent grab sample
BOD5:	2/week 24-hr composite samples of influent (BOD_5) and effluent (CBOD)
TSS:	2/week 24-hr composite samples of influent and effluent
Residual Chlorine:	Daily grab sample of final effluent
Fecal Coliform:	2/week final effluent grab samples

In addition to these minimum requirements, the draft permit includes monitoring requirements for ammonia at the RBC facility effluent as well as process monitoring for the Lagoon Facility's anaerobic cell. The past permit required quarterly monitoring of the RBC plant's effluent for ammonia because anticipated discharge levels were close to the water quality limit. As shown in the DMR data in Appendix F, actual discharges were consistently less than the levels that would have been set for a water quality-based limit. The closest that the discharge levels came to a maximum water quality limit level was 83.5% of the limit. Based on this data, there is no reasonable potential for the discharge to exceed water quality standards. However, the levels are still close enough to warrant monitoring during the periods most likely to exceed water quality standards. Therefore, monitoring for ammonia will be required as a minimum of 2 grab samples during the fall/winter season (October through February). No ammonia monitoring is warranted for the Lagoon Facility.

The anaerobic pretreatment cell at the Lagoon Facility meets the definition of "new or developmental technology," as defined in *Criteria for Sewage Works Design (Orange Book)*, 1998. Process monitoring of the anaerobic cell is warranted to confirm process capabilities. Monitoring shall consist of influent and effluent CBOD and TSS concentrations, effluent pH, dissolved oxygen and alkalinity and overall CBOD and TSS treatment efficiency. In addition, city public works staff shall perform qualitative monitoring of odors to determine the distance from the facility where odors are noticeable. This analysis should include a record of citizen complaints (if any are made) regarding odors from the lagoon area. All process control monitoring requirements of the anaerobic cell will expire on December 31, 2005.

The proposed permit also includes requirements for effluent monitoring to be used in submission of the next permit application.

Monitoring of biosolids quantity and quality is necessary to determine the appropriate uses of the biosolids. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503. While Washington State has not yet been delegated authority to administer the federal biosolids program, please note that EPA will consider the next application to be incomplete unless form 2S, characterizing biosolids and sludge produced by the facilities, is also submitted. Form 2S involves a substantial amount of sludge testing in order to complete the application. Completed copies of this form needs to be submitted to EPA as well as to Ecology's Solid Waste and Financial Assistance program.

LAB ACCREDITATION

With the exception of certain parameters, the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The laboratory for these facilities is accredited for general chemistry and microbiology.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3 are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in proposed permit Requirement S.4 to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4 restricts the amount of flow.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems, the Permittee is required in Special Condition S.7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of biosolids from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 70.95J RCW and Chapter 173-308 WAC, "Biosolids Management." The disposal of other solid waste is under the jurisdiction of the Island County Health Department.

PRETREATMENT

FEDERAL AND STATE PRETREATMENT PROGRAM REQUIREMENTS

Under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986), the Department of Ecology (Department) has been delegated authority to administer the Pretreatment Program [i.e. act as the Approval Authority for oversight of delegated Publicly Owned Treatment Works (POTWs)]**.** Under this delegation of authority, the Department has exercised the option of issuing wastewater discharge permits for significant industrial users discharging to POTWs which have not been delegated authority to issue wastewater discharge permits.

There are a number of functions required by the Pretreatment Program which the Department is delegating to such POTWs because they are in a better position to implement the requirements (e.g. tracking the number and general nature of industrial dischargers to the sewerage system). The requirements for a Pretreatment Program are contained in Title 40, Part 403 of the Code of Federal Regulations. Under the requirements of the Pretreatment Program [40 CFR 403.8(f)(1)(iii)], the Department is required to approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8 (f)(1)(i)].

The Department is responsible for issuing State Waste Discharge Permits to SIUs and other industrial users of the Permittee's sewer system. Industrial dischargers must obtain these permits from the Department prior to the Permittee accepting the discharge [WAC 173-216-110(5)] (Industries discharging wastewater that is similar in character to domestic wastewater are not required to obtain a permit. Such dischargers should contact the Department to determine if a permit is required.). Industrial dischargers need to apply for a State Waste Discharge Permit sixty (60) days prior to commencing discharge. The conditions contained in the permits will include any applicable conditions for categorical discharges, loading limitations included in contracts with the POTW, and other conditions necessary to assure compliance with State water quality standards and biosolids standards.

The Department requires this POTW to fulfill some of the functions required for the Pretreatment Program in the NPDES permit (e.g. tracking the number and general nature of industrial dischargers to the sewage system). The POTW's NPDES permit will require that all SIUs currently discharging to the POTW be identified and notified of the requirement to apply for a wastewater discharge permit from the Department. None of the obligations imposed on the POTW relieve an industrial or commercial discharger of its primary responsibility for obtaining a wastewater discharge permit (if required), including submittal of engineering reports prior to construction or modification of facilities (40 CFR 403.12(j) and WAC 173-216-070 and WAC 173-240-110, et seq.).

WASTEWATER PERMIT REQUIRED

RCW 90.48 and WAC 173-216-040 require SIUs to obtain a permit prior to discharge of industrial waste to the Permittee's sewerage system. This provision prohibits the POTW from accepting industrial wastewater from any such dischargers without authorization from the Department.

REQUIREMENTS FOR ROUTINE IDENTIFICATION AND REPORTING OF INDUSTRIAL USERS

The NPDES permit requires non-delegated POTWs to "take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging to the Permittee's sewerage system." Examples of such routine measures include regular review of business tax licenses for existing businesses and review of water billing records and existing connection authorization records. System maintenance personnel can also be diligent during performance of their jobs in identifying and reporting as-yet unidentified industrial dischargers. Local newspapers, telephone directories, and word-of-mouth can also be important sources of information regarding new or existing discharges. The POTW is required to notify an industrial discharger, in writing, of their responsibilities regarding application for a State waste discharge permit and to send a copy of the written notification to the Department. The Department will then take steps to solicit a State waste discharge permit application.

REQUIREMENTS FOR PERFORMING AN INDUSTRIAL USER SURVEY

This POTW has the potential to serve significant industrial or commercial users and is required to perform an Industrial User Survey. The goal of this survey is to develop a list of SIUs and PSIUs, and of equal importance, to provide sufficient information about industries which discharge to the POTW, to determine which of them require issuance of State waste discharge permits or other regulatory controls. An Industrial User Survey is an important part of the regulatory process used to prevent interference with treatment processes at the POTW and to prevent the exceedance of water quality standards. The Industrial User Survey also can be used to contribute to the maintenance of sludge quality, so that sludge can be a useful biosolids product rather than an expensive waste problem. An Industrial User Survey is a rigorous method for identifying existing, new, and proposed significant industrial users and potential significant industrial users. A complete listing of methodologies is available in the Department of Ecology guidance document entitled "Conducting an Industrial User Survey."

DUTY TO ENFORCE DISCHARGE PROHIBITIONS

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants which cause pass through or interference. The definitions of pass through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise corrosive, or obstructive to the system. In addition, wastes with excessive BOD, petroleum-based oils, or which result in toxic gases are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges unless the POTW receives prior authorization from the Department. The discharges include cooling water in significant volumes, stormwater and other direct inflow sources, and wastewaters significantly affecting system hydraulic loading, which do not require treatment.

SUPPORT BY THE DEPARTMENT FOR DEVELOPING PARTIAL PRETREATMENT PROGRAM BY POTW

The Department has committed to providing technical and legal assistance to the Permittee in fulfilling these joint obligations, in particular, assistance with developing an adequate sewer use ordinance, notification procedures, enforcement guidelines, and developing local limits and inspection procedures.

OUTFALL EVALUATION

Proposed permit Condition S.11 requires the Permittee to conduct an outfall inspection of the Lagoon outfall (#002) and submit a report detailing the findings of that inspection. The purpose of the inspection is to determine the condition of the discharge pipe and diffusers and to determine if sediment is accumulating in the vicinity of the outfall. As an inspection was performed on the RBC outfall (#001) during the last permit term, no inspection of that outfall is needed.

GENERAL CONDITIONS

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary, to meet water quality standards, sediment quality standards, or ground water standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the state of Washington. The Department proposes that this permit be issued for five (5) years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Metcalf and Eddy.

2003. Wastewater Engineering, Treatment, Disposal, and Reuse. Fourth Edition.

Sear-Brown/URS Consultants

2004 Oak Harbor Seaplane WWTP Improvement: Addendum to the 1987 Engineering Report.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information
(http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

Washington State Department of Ecology.

2004. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

URS Consultants

1995 Mixing Zone Study: Outfall 001 (Oak Harbor), Outfall 002 (Crescent Harbor).

1997 Comprehensive Sewer Plan (Draft), City of Oak Harbor.

2004 RBC Wastewater Treatment Plant Capacity Analysis: An Addendum to the Engineering Report for the Upgrade of Secondary Treatment Facilities; NAS/Seaplane Base, June 1987.

APPENDIX A—PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page one of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public Notice of Application (PNOA) was published on March 6, 2004 and March 13, 2004 in the *Whidbey News Times/Record* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department published a Public Notice of Draft (PNOD) on April 20, 2005 in the *Whidbey News Times/Record* to inform the public that a draft permit and fact sheet were available for review. Interested persons were invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents were available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments were mailed to:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30)-day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, (425) 649-7037, or by writing to the address listed above.

This permit and fact sheet were written by Shawn McKone, Facility Manager.

APPENDIX B—GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART--An acronym for "all known, available, and reasonable methods of prevention, control, and treatment."

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in waste water. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect waste water.

Average Monthly Discharge Limitation--The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation--The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

$CBOD_5$--The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celsius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining $CBOD_5$ is given in 40 CFR Part 136.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous Monitoring--Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User--A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference--A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in State regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through--A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the State of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

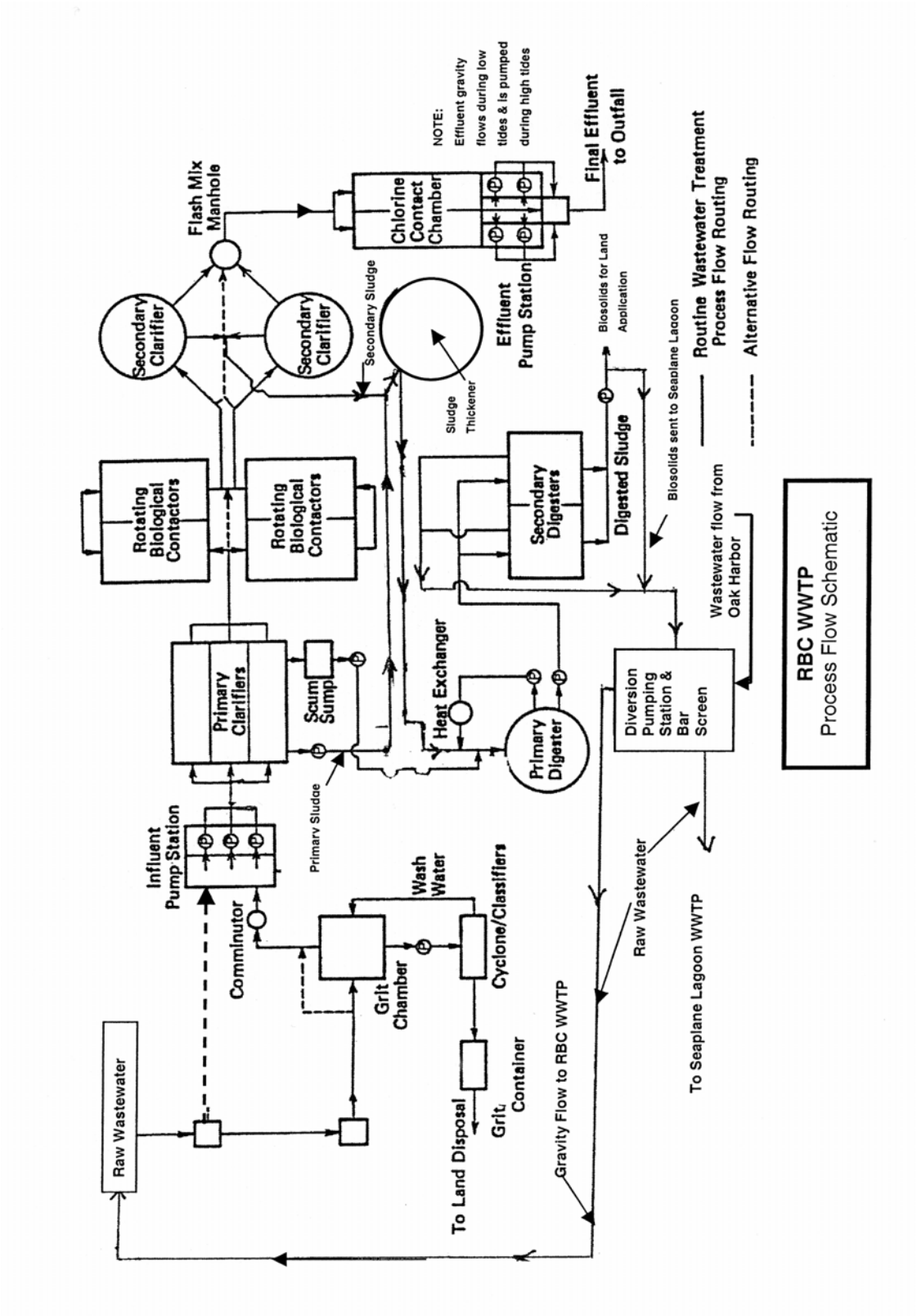
APPENDIX C—TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

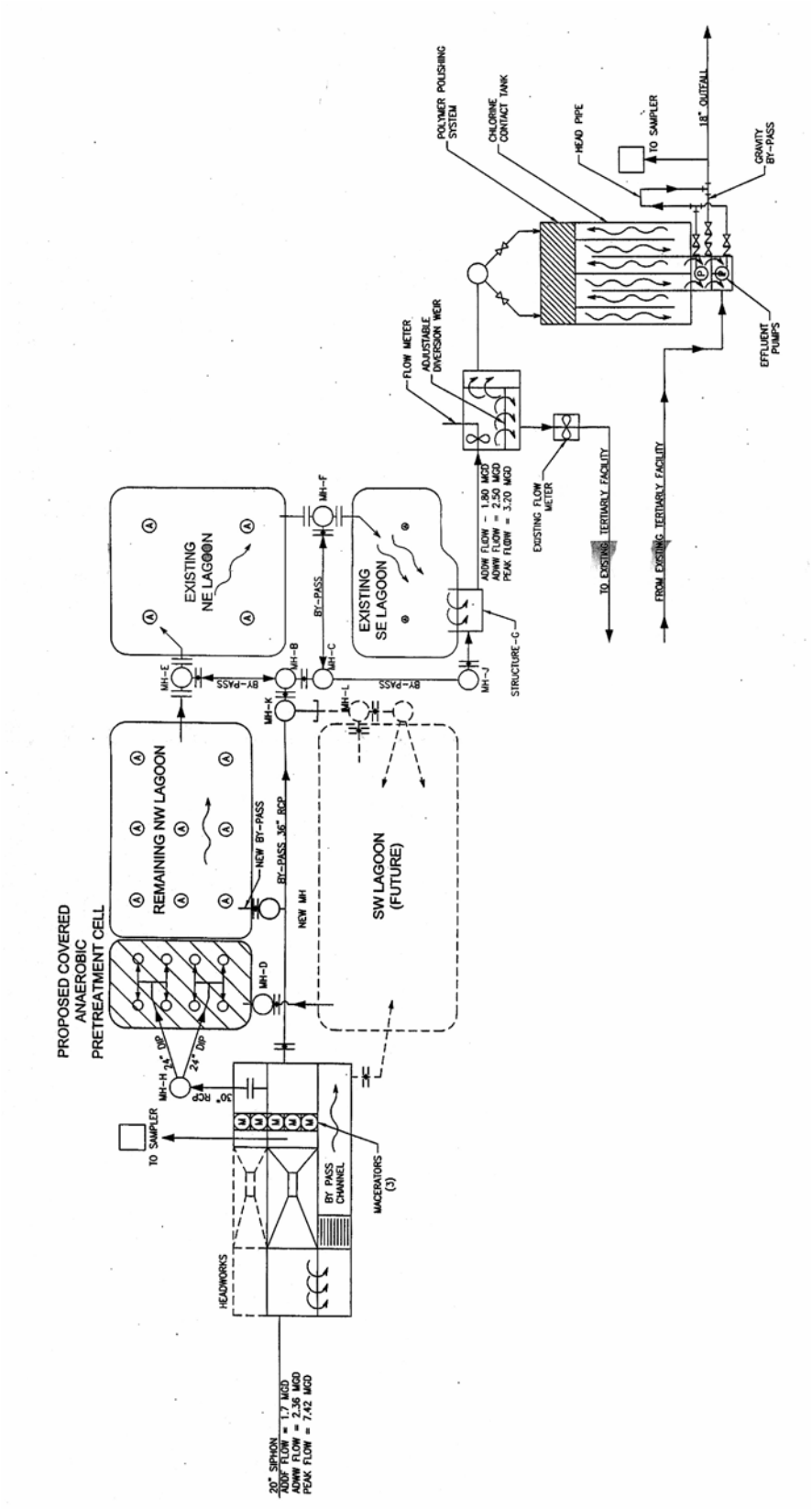
APPENDIX D—RESPONSE TO COMMENTS

No public comments received with regards to the renewal of this permit.

APPENDIX E—PLANT LAYOUT



Seaplane Lagoon Facility Layout


POLYMER POLISHING SYSTEM
CHLORINE CONTACT TANK
HEAD PIPE
TO SAMPLER
18" OUTFALL
GRAVITY BY-PASS
EFFLUENT PUMPS
FLOW METER
ADJUSTABLE DIVERSION WEIR
ADDF FLOW = 1.80 MGD
ADWF FLOW = 2.50 MGD
PEAK FLOW = 3.70 MGD
EXISTING FLOW METER
TO EXISTING TERTIARY FACILITY
FROM EXISTING TERTIARY FACILITY
STRUCTURE-G
EXISTING NE LAGOON
EXISTING SE LAGOON
MH-F
BY-PASS
MH-C
MH-E
MH-B
MH-K
MH-L
MH-J
REMAINING NW LAGOON
NEW BY-PASS
BY-PASS 36" RCP
NEW MH
SW LAGOON (FUTURE)
PROPOSED COVERED ANAEROBIC PRETREATMENT CELL
MH-D
MH-H
24" DIP
24" DIP
30" RCP
TO SAMPLER
BY PASS CHANNEL
MACERATORS (3)
HEADWORKS
20" SIPHON
ADDF FLOW = 1.7 MGD
ADWF FLOW = 2.36 MGD
PEAK FLOW = 7.42 MGD

APPENDIX F—DMR DATA SUMMARY—RBC PLANT

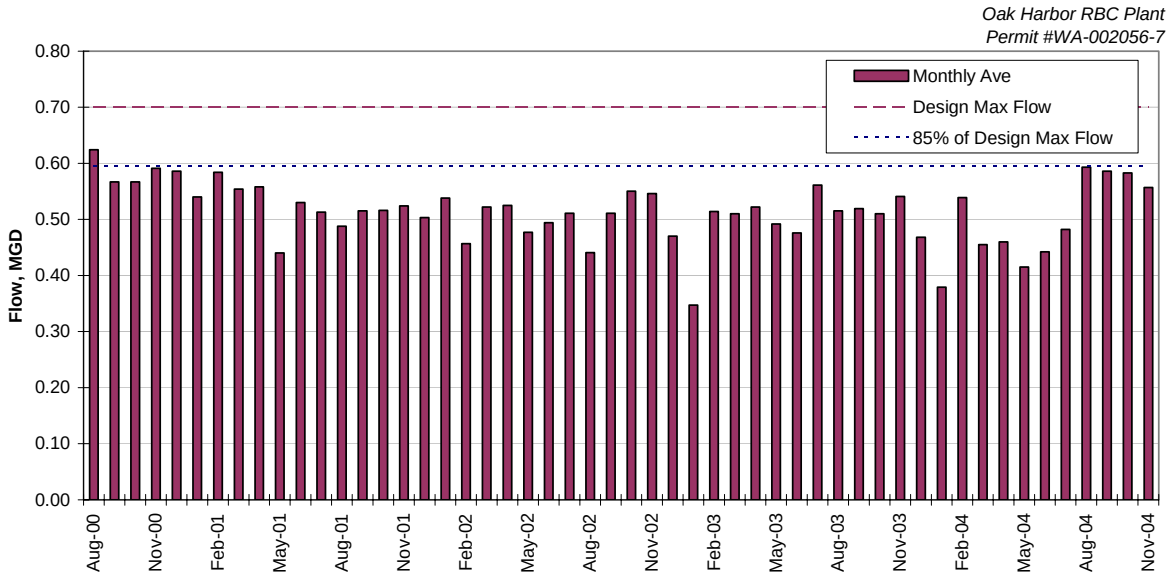
The following tables and graphs summarize data reported to the Department in monthly Discharge Monitoring Reports from August 2000 to November 2004 for the RBC Facility.

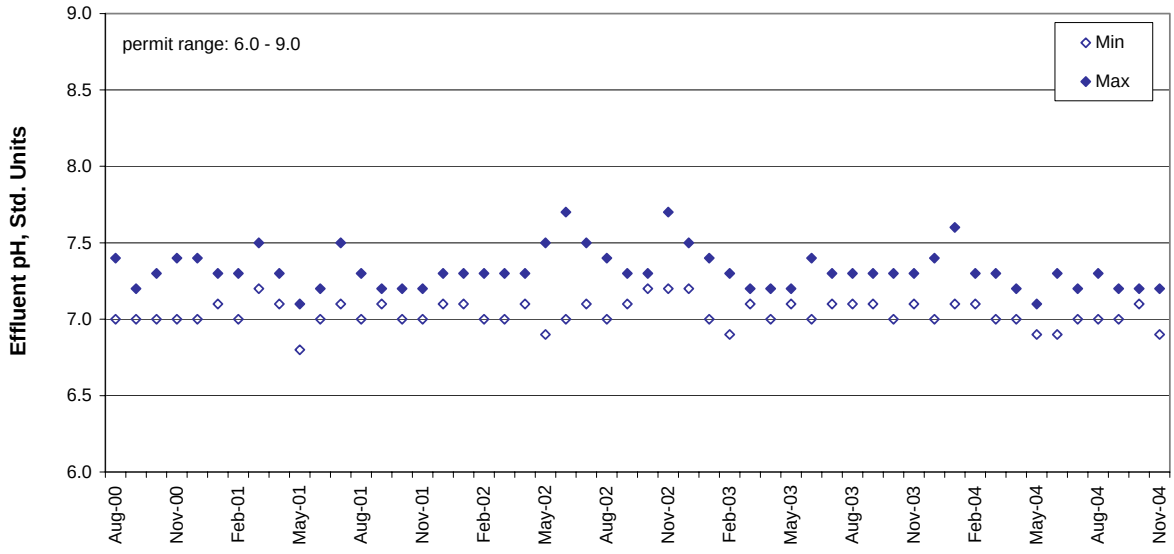
Discharge Monitoring Data, 2000-2004

Facility: Oak Harbor RBC Plant
Permit No: WA-002056-7

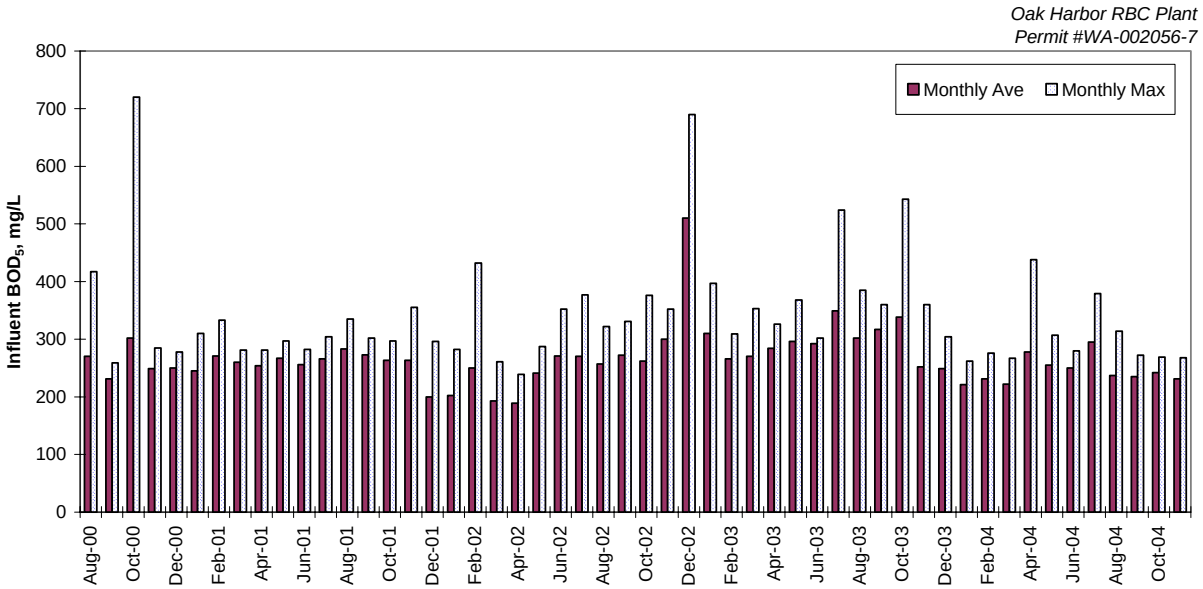
	Influent								Effluent																					
Date	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	BOD, % Removal	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	TSS, % Removal	PH	PH	Fecal Coliform, #/100 ml	Fecal Coliform, #/100 ml	Ammonia, mg/l (as N)	Chlorine, mg/L	Chlorine, mg/L	Chlorine, ppd	
	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Wkly Ave	Monthly Ave	Wkly Ave	Ave	Monthly Ave	Wkly Ave	Monthly Ave	Wkly Ave	Ave	Min	Max	GEM	GM7	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	
August-00	270	417	1,400	1,965	203	426	1,045	2,007	0.624	0.661	24	28	127	192	91	11	13	59	86	94	7.0	7.4	28	97	21.90	0.27	0.36	1.40	
September-00	231	259	231	259	176	204	832	999	0.567	0.650	19	29	92	152	92	9	10	42	52	95	7.0	7.2	22	43	20.30	0.31	0.44	1.40	
October-00	302	720	1,436	3,339	230	189	1,055	896	0.567	0.632	20	22	93	121	94	9	9	41	54	95	7.0	7.3	15	46	18.10	0.43	0.52	2.03	
November-00	249	285	1,252	1,409	206	268	1,032	1,316	0.591	0.662	22	25	109	145	91	11	13	49	73	95	7.0	7.4	21	42	25.90	0.44	0.54	2.17	
December-00	250	278	1,210	1,333	218	260	1,052	1,213	0.586	0.663	24	26	115	138	90	9	11	46	58	96	7.0	7.4	15	24	23.60	0.40	0.54	1.95	
January-01	245	310	1,097	1,287	186	232	832	964	0.540	0.682	19	23	88	123	92	10	11	45	57	95	7.1	7.3	18	33	19.60	0.39	0.70	1.76	
February-01	271	333	1,341	1,658	197	242	977	1,201	0.584	0.648	19	21	94	111	93	8	10	40	50	96	7.0	7.3	8	28	18.70	0.31	0.46	1.51	
March-01	260	281	1,259	1,439	216	272	1,043	1,273	0.554	0.654	18	23	88	117	93	10	11	47	58	96	7.2	7.5	11	18	22.30	0.26	0.40	1.20	
April-01	254	281	1,194	133	184	212	860	1,006	0.558	0.617	15	15	70	82	94	9	10	40	45	95	7.1	7.3	34	89	20.60	0.24	0.38	1.12	
May-01	267	297	1,104	1,335	210	246	865	1,074	0.440	0.593	18	22	76	107	93	8	9	33	39	96	6.8	7.1	10	34	17.60	0.31	0.54	1.14	
June-01	256	282	1,140	1,301	213	246	951	1,124	0.530	0.600	18	20	79	92	93	9	10	38	51	96	7.0	7.2	21	38	22.70	0.24	0.59	1.06	
July-01	266	304	1,159	1,379	238	278	1,037	1,261	0.513	0.573	17	19	73	85	94	8	10	36	46	97	7.1	7.5	11	15	25.50	0.20	0.62	0.86	
August-01	283	335	1,246	1,470	240	280	1,061	1,228	0.488	0.566	17	19	73	91	94	9	10	39	48	96	7.0	7.3	27	62	21.30	0.16	0.54	0.65	
September-01	273	302	1,189	1,302	238	260	1,033	1,124	0.515	0.580	19	25	83	107	93	9	11	38	51	96	7.1	7.2	15	34	0.00	0.17	0.32	0.73	
October-01	263	297	1,153	1,271	227	264	993	1,130	0.516	0.590	16	18	69	80	94	9	11	37	50	96	7.0	7.2	24	52	23.10	0.27	0.46	1.16	
November-01	263	355	1,185	1,540	237	358	1,063	1,553	0.524	0.617	19	22	86	129	93	12	13	54	72	95	7.0	7.2	21	30	19.40	0.27	0.40	1.18	
December-01	200	296	816	1,038	173	234	692	875	0.503	0.672	23	27	93	130	89	11	12	43	60	94	7.1	7.3	12	26	17.30	0.33	0.50	1.38	
January-02	202	282	909	1,461	158	212	704	861	0.538	0.684	22	31	101	180	89	11	14	48	77	93	7.1	7.3	9	24	17.20	0.36	0.49	1.62	
February-02	250	432	906	1,420	210	300	759	1,086	0.457	0.652	14	17	52	67	94	7	10	27	43	96	7.0	7.3	25	63	8.70	0.25	0.38	0.95	
March-02	193	261	867	1,106	218	366	1,022	1,993	0.522	0.706	15	17	69	100	92	9	11	40	60	96	7.0	7.3	18	45	13.90	0.29	0.40	1.26	
April-02	189	239	826	1,044	198	262	864	1,145	0.525	0.567	17	19	72	87	91	8	10	34	49	96	7.1	7.3	21	39	16.80	0.28	0.33	1.26	
May-02	241	287	978	1,372	233	280	942	1,338	0.477	0.600	17	19	67	86	93	9	10	37	47	96	6.9	7.5	20	32	21.70	0.20	0.31	0.80	
June-02	271	352	1,110	1,553	240	280	974	1,143	0.494	0.608	15	18	63	88	94	9	10	35	44	96	7.0	7.7	12	25	24.40	0.19	0.29	0.78	
July-02	270	377	1,176	1,644	230	316	1,002	1,378	0.511	0.561	14	18	61	80	95	8	9	34	44	97	7.1	7.5	15	21	26.20	0.19	0.26	0.81	
August-02	257	322	942	1,158	225	260	831	1,084	0.441	0.535	14	17	55	75	94	8	9	30	38	96	7.0	7.4	16	85	23.20	0.19	0.38	0.70	
September-02	272	331	1,189	1,612	231	376	1,015	1,831	0.511	0.603	14	16	61	77	95	9	12	38	63	96	7.1	7.3	33	46	27.20	0.12	0.27	0.51	
October-02	262	376	1,208	1,775	246	356	1,137	1,680	0.550	0.587	16	17	73	82	94	8	10	36	52	97	7.2	7.3	9	24	32.90	0.29	0.52	1.33	
November-02	300	352	1,350	1,615	279	300	1,258	1,361	0.546	0.604	18	21	81	101	94	10	11	43	53	97	7.2	7.7	7	12	32.00	0.23	0.49	1.05	
December-02	510	690	**2,083**	3,269	439	586	1,780	2,683	0.470	0.607	24	33	91	110	95	12	16	46	55	97	7.2	7.5	10	35	32.60	0.01	0.06	0.04	
January-03	310	397	881	1,349	257	328	725	1,340	0.347	0.557	20	34	58	84	94	12	18	29	49	95	7.0	7.4	18	56	27.40	0.02	0.17	0.06	
February-03	266	309	1,120	1,314	224	304	944	1,247	0.514	0.557	19	24	81	115	93	9	10	37	47	96	6.9	7.3	4	14	26.90	0.01	0.06	0.04	
March-03	270	353	1,170	1,460	235	304	1,015	1,258	0.510	0.574	16	19	68	81	94	8	9	36	44	96	7.1	7.2	4	6	23.40	0.02	0.06	0.09	
April-03	284	326	1,247	1,444	245	310	1,075	1,326	0.522	0.556	13	15	56	73	96	7	9	32	41	97	7.0	7.2	6	15	21.70	0.01	0.06	0.04	
May-03	296	368	1,183	1,571	275	396	1,099	1,691	0.492	0.542	13	16	53	65	95	7	9	30	34	97	7.1	7.2	8	15	26.10	0.02	0.09	0.08	
June-03	292	302	1,109	1,351	261	300	952	1,218	0.476	0.600	13	18	50	66	96	8	9	28	34	97	7.0	7.4	13	38	26.60	0.03	0.17	0.12	
July-03	349	524	**1,647**	2,570	306	458	1,444	2,204	0.561	0.606	15	21	72	106	96	9	12	40	68	97	7.1	7.3	12	30	31.10	0.02	0.05	0.09	
August-03	302	385	1,309	1,727	249	276	1,077	1,347	0.515	0.624	16	23	69	117	95	7	10	32	49	97	7.1	7.3	11	14	29.10	0.01	0.03	0.04	
September-03	317	360	1,351	1,747	257	272	1,093	1,301	0.519	0.601	17	21	72	102	95	8	9	32	44	97	7.1	7.3	10	12	30.60	0.02	0.16	0.09	
October-03	338	543	1,455	2,278	288	488	1,241	2,141	0.510	0.605	15	21	65	101	96	8	9	34	40	97	7.0	7.3	10	19	29.20	0.02	0.08	0.09	
November-03	252	360	1,172	1,594	198	316	925	1,399	0.541	0.710	13	16	62	68	95	8	10	38	49	96	7.1	7.3	9	20	23.40	0.01	0.04	0.05	
December-03	249	304	952	1,382	190	220	722	973	0.468	0.623	16	19	58	71	94	8	11	31	39	96	7.0	7.4	18	30	26.90	0.01	0.03	0.04	
January-04	221	262	640	856	169	204	498	760	0.379	0.679	16	22	46	64	93	9	9	26	39	95	7.1	7.6	23	278	20.20	0.01	0.11	0.03	
February-04	231	276	1,021	1,199	186	212	825	948	0.539	0.646	17	20	74	88	93	7	8	33	37	96	7.1	7.3	6	10	26.90	0.02	0.04	0.09	
March-04	222	267	823	1,127	186	238	692	1,002	0.455	0.585	20	24	77	107	91	10	12	39	54	94	7.0	7.3	9	15	21.50	0.01	0.07	0.04	
April-04	278	438	1,052	1,458	231	408	868	1,358	0.460	0.577	18	23	70	108	93	10	14	37	63	96	7.0	7.2	12	39	25.50	0.01	0.05	0.04	
May-04	255	307	921	1,073	212	260	769	909	0.415	0.509	17	19	63	74	93	9	11	31	42	96	6.9	7.1	15	53	20.80	0.01	0.03	0.03	
June-04	250	280	921	1,179	201	248	741	914	0.442	0.563	13	15	48	69	95	7	9	26	41	96	6.9	7.3	13	37	19.60	0.01	0.04	0.04	
July-04	295	379	1,218	1,420	271	432	1,121	1,434	0.482	0.590	17	19	72	91	94	7	8	30	36	97	7.0	7.2	57	161	27.80	0.02	0.05	0.08	
August-04	237	314	1,452	1,812	212	266	1,320	1,794	0.593	0.711	17	18	82	87	93	9	10	45	59	95	7.0	7.3	18	17	32.30	0.03	0.04	0.15	
September-04	235	272	1,163	1,355	205	244	1,015	1,164	0.586	0.645	15	19	77	97	93	8	8	38	42	96	7.0	7.2	20	27	26.20	0.02	0.05	0.10	
October-04	242	269	1,185	1,330	205	222	1,004	1,076	0.583	0.648	17	24	83	123	93	8	10	38	54	96	7.1	7.2	18	21	25.10	0.02	0.07	0.10	
November-04	231	268	1,085	1,368	178	218	831	980	0.557	0.656	15	18	71	98	94	8	8	36	44	96	6.9	7.2	8	12	18.80	0.02	0.10	0.09	
since 4/00: AVE:	266	342	1135	1470	226	294	975	1300	0.514	0.614	17	21	75	100	93	9	11	38	50	96	7.0	7.3	16	40	23.11	0.15	0.27	0.68	
MIN:	189	239	231	133	158	189	498	760	0.347	0.509	13	15	46	64	89	7	8	26	34	93	6.8	7.1	4	6	0.00	0.01	0.03	0.03	
MAX:	510	720	2083	3339	439	586	1780	2683	0.624	0.711	24	34	127	192	96	12	18	59	86	97	7.2	7.7	57	278	32.90	0.44	0.70	2.17	
LIMIT:			1,275				1,700		0.595		30	45	175	263	85	30	45	175	263	85	6.0	9.0	200	400	**39.40**	0.114	0.30	0.67	Final
DESIGN:			1,500				2,000		0.700																	0.50	0.75	2.92	to 11/0

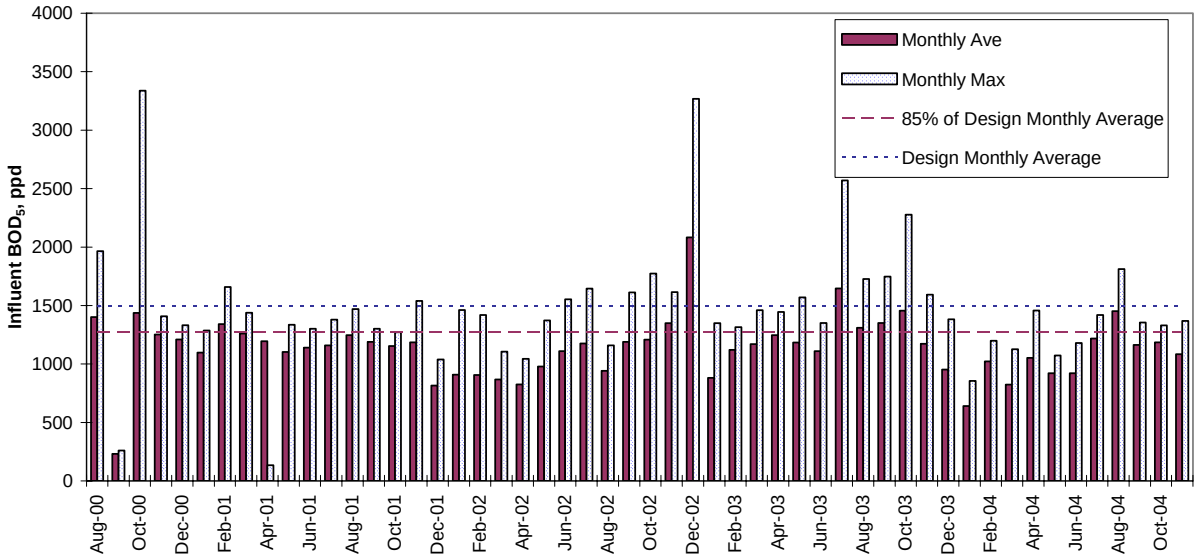
Discharge Monitoring Data, Flow and Effluent pH, 2000-2004





Discharge Monitoring Data, Influent BOD5, 2000-2004





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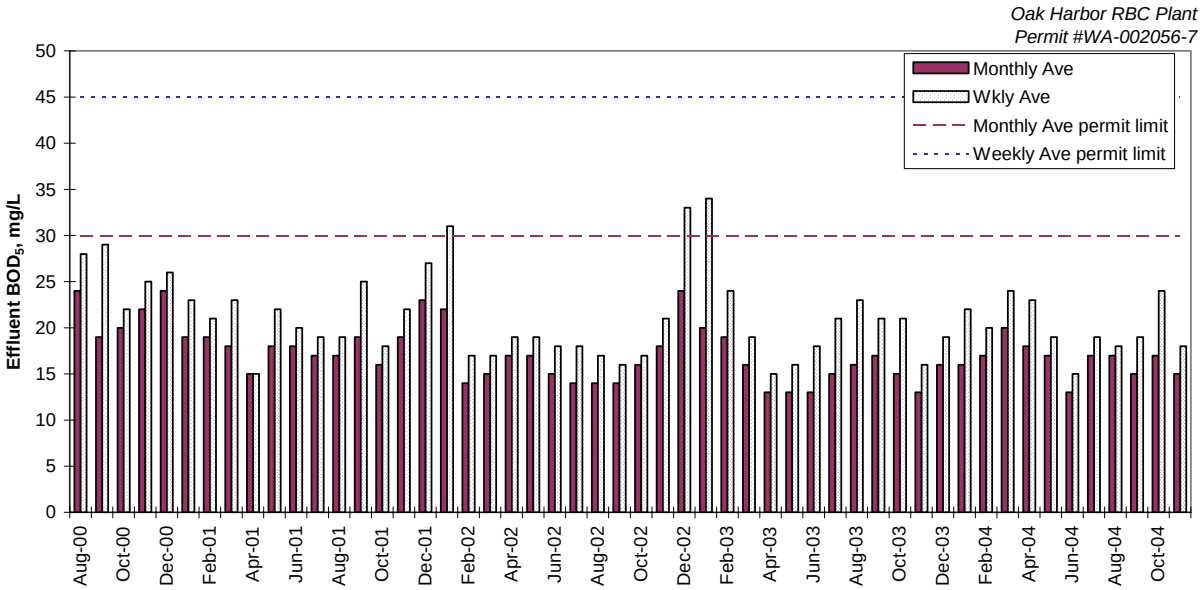
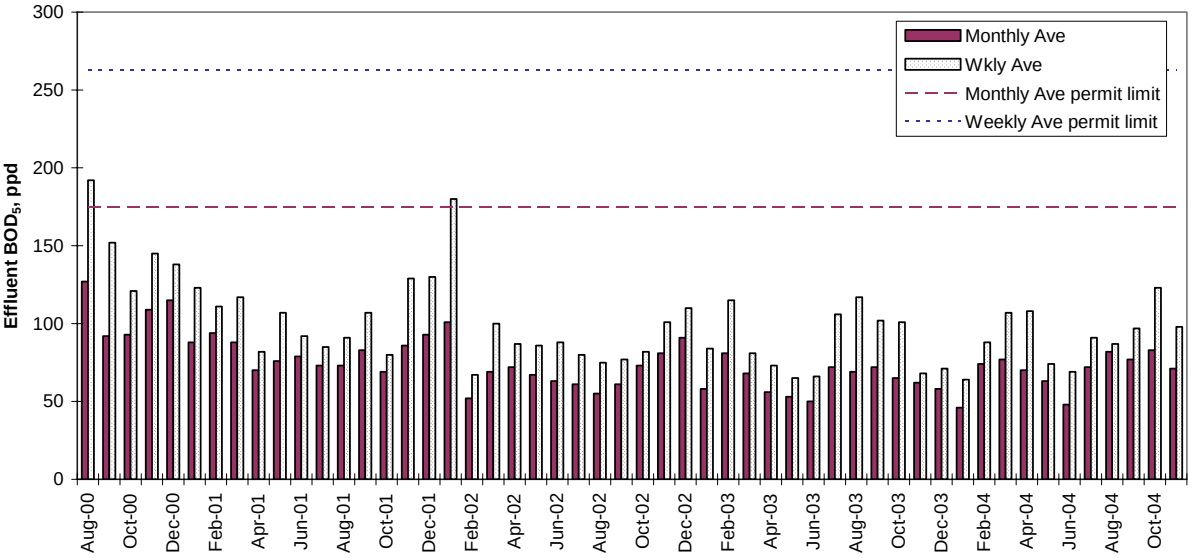
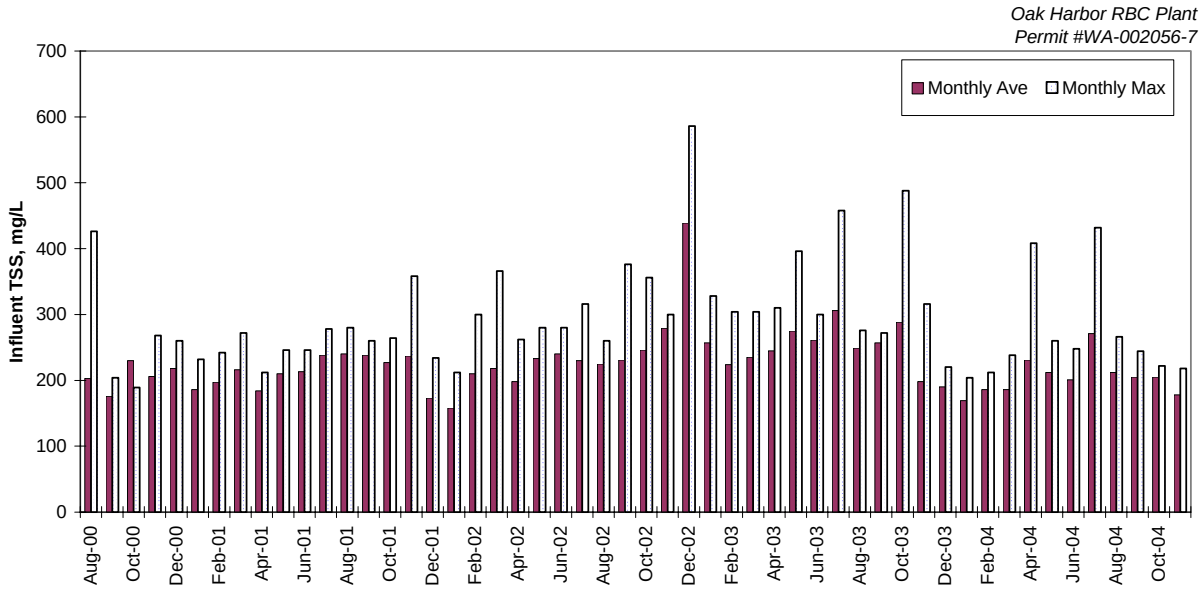
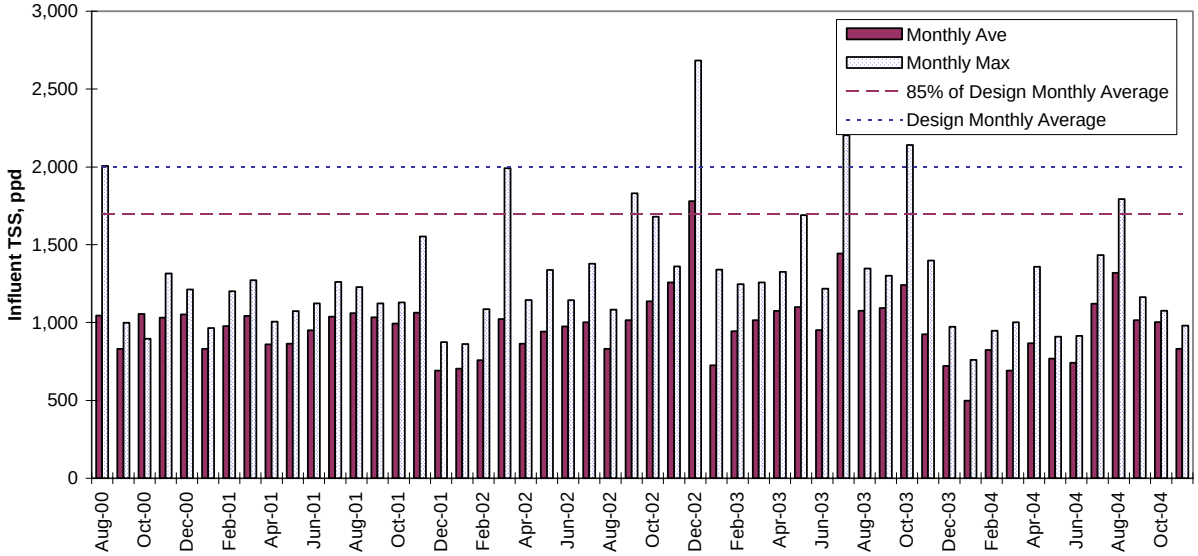


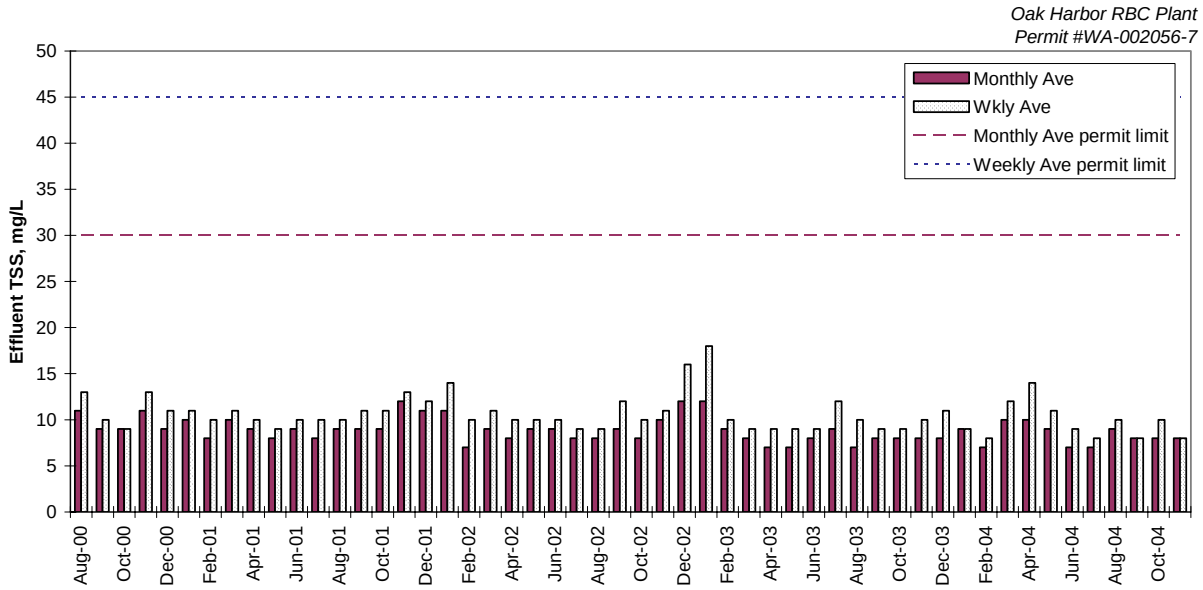


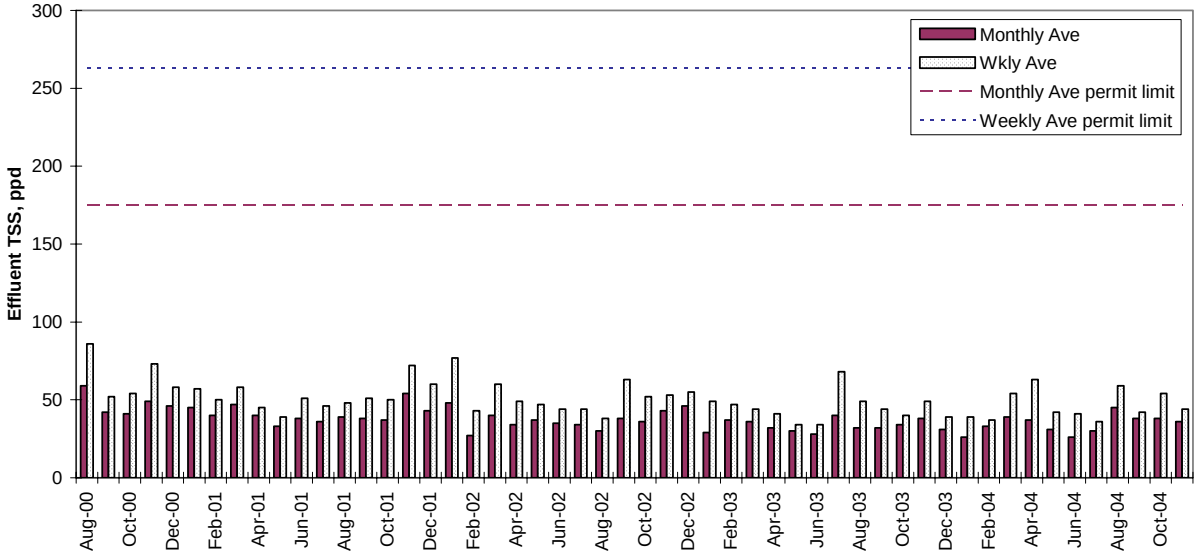
Discharge Monitoring Data, Influent TSS, 2000-2004



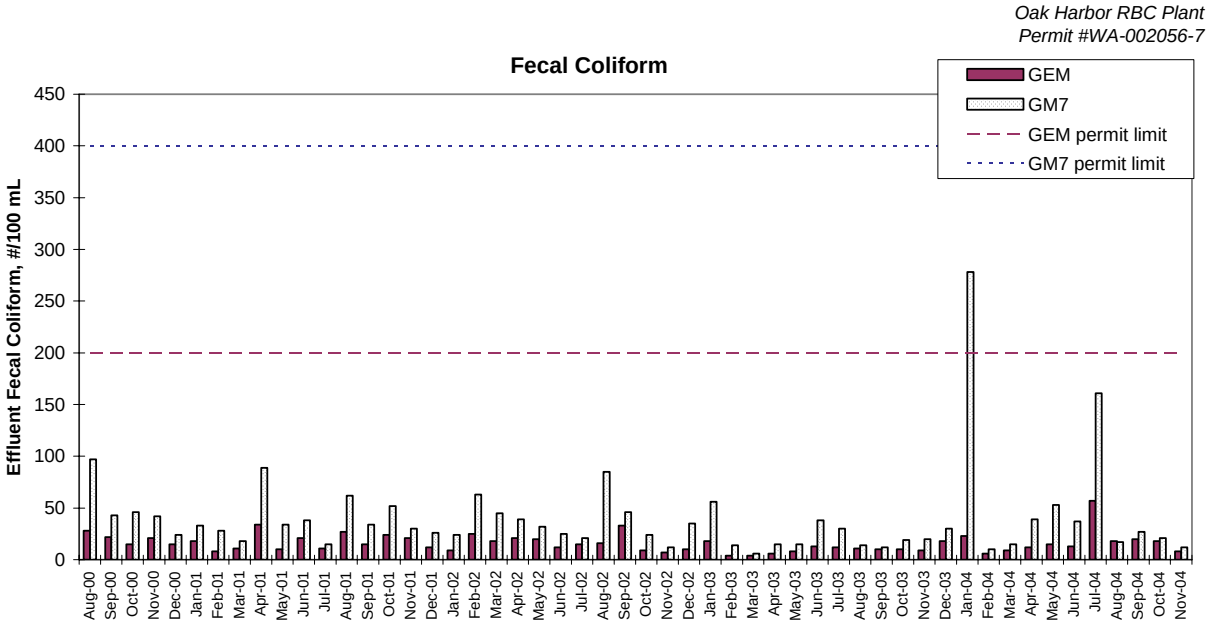


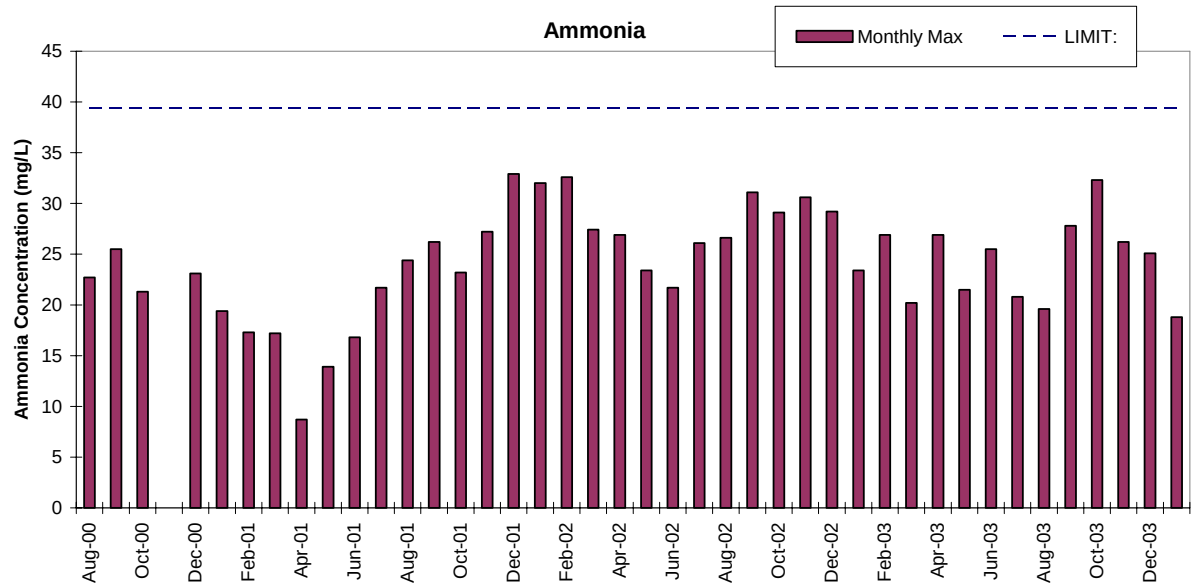
Discharge Monitoring Data, Effluent TSS, 2000-2004





Discharge Monitoring Data, Effluent Fecal Coliform and Ammonia, 2000-2004





APPENDIX G—DMR DATA SUMMARY—LAGOON FACILITY

The following tables and graphs summarize data reported to the Department in monthly Discharge Monitoring Reports from August 2000 to November 2004 for the Lagoon Facility.

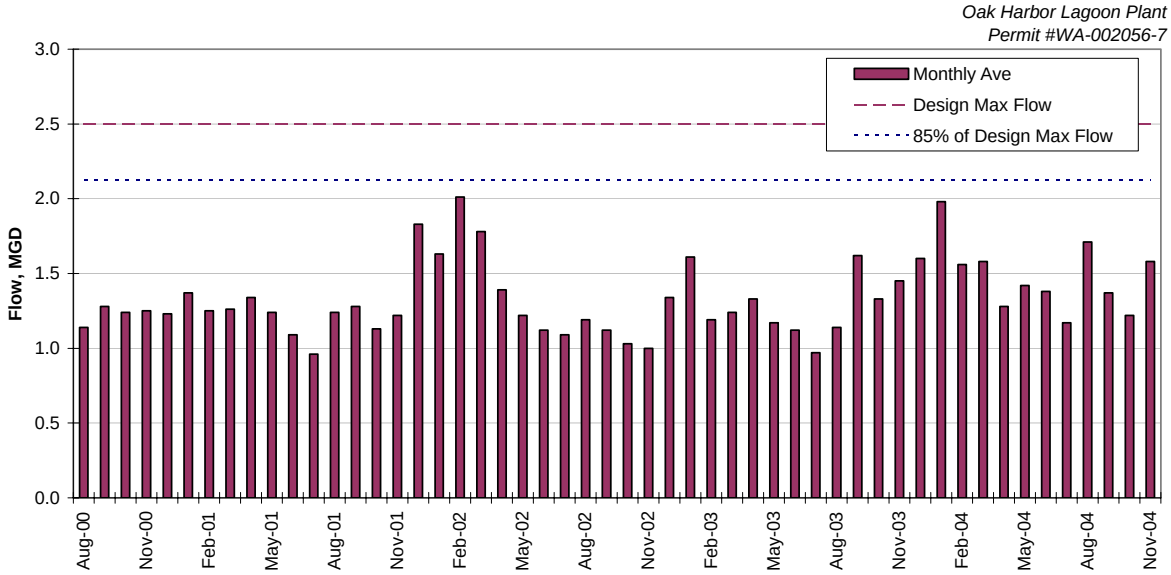
Discharge Monitoring Data, 2000-2004

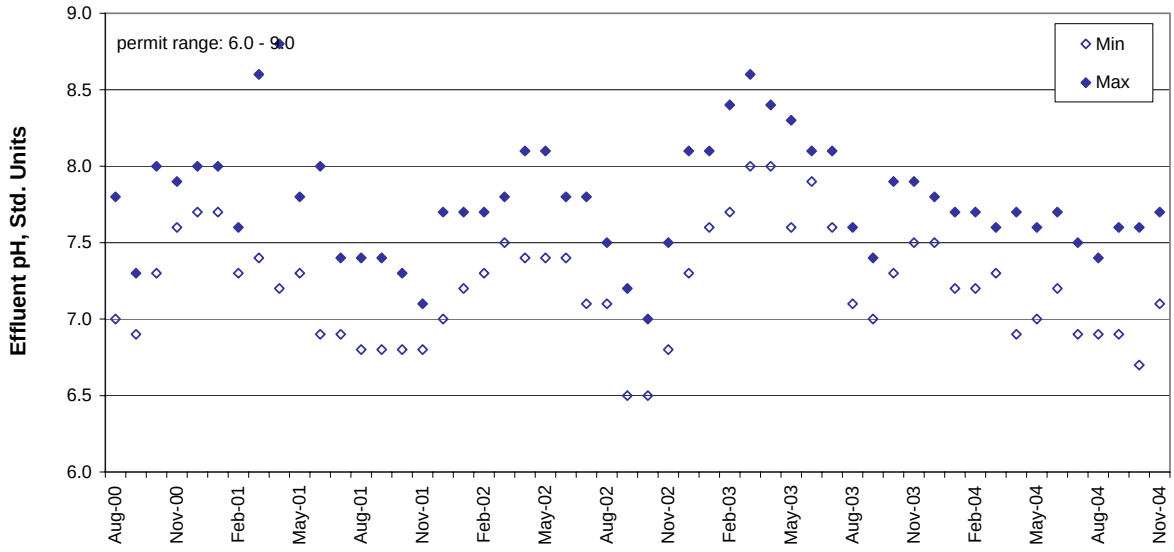
Facility: Oak Harbor Lagoon Plant
Permit No: WA-002056-7

	Influent									Effluent																				
Date	CBOD, mg/L	CBOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	Flow, MGD	Flow, MGD	CBOD, mg/L	CBOD, mg/L	CBOD, ppd	CBOD, ppd	CBOD, % Removal	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	TSS, % Removal	PH	PH	Fecal Coliform, #/100 ml	Fecal Coliform, #/100 ml	Chlorine, mg/L	Chlorine, mg/L	Chlorine, ppd
	Monthly Ave	Monthly Max	Monthly Ave	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Wkly Ave	Monthly Ave	Wkly Ave	Ave	Monthly Ave	Monthly Max	Monthly Ave	Wkly Ave	Ave	Min	Max	GEM	GM7	Monthly Ave	Monthly Max	Monthly Ave
August-00	208	275	245	2,020	2,502	317	1170	2,642	10,051	1.140	1.420	8	18	79	180	96	17	31	175	310	94	7.0	7.8	7	32	0.28	0.51	2.70
September-00	194	216	230	2,077	2,367	216	286	1,944	2,600	1.280	1.710	9	18	93	221	95	13	21	141	212	93	6.9	7.3	3	10	0.34	0.63	3.60
October-00	253	540	218	1,960	2,333	200	248	1,916	2,317	1.240	1.710	8	14	88	194	97	12	16	119	146	94	7.3	8.0	2	3	0.35	0.48	3.60
November-00	180	236	226	2,385	2,823	237	360	2,403	3,365	1.250	1.640	9	12	88	143	95	13	21	134	187	94	7.6	7.9	5	18	0.34	0.47	5.00
December-00	198	234	245	2,398	2,977	262	396	2,578	3,930	1.230	1.460	14	18	144	182	93	18	23	187	224	93	7.7	8.0	6	8	0.32	0.40	3.25
January-01	189	234	220	2,425	2,630	242	348	2,685	3,715	1.370	1.940	16	18	173	206	92	17	22	187	287	93	7.7	8.0	8	90	0.41	0.64	4.68
February-01	182	247	313	3,294	6,906	230	592	2,385	6,813	1.250	1.600	15	17	159	214	92	16	18	165	240	93	7.3	7.6	3	4	0.32	0.43	3.34
March-01	177	218	241	2,323	2,957	288	412	2,187	4,158	1.260	1.710	19	25	199	306	89	32	36	327	615	86	7.4	8.6	3	9	0.33	0.49	3.46
April-01	143	219	195	1,953	2,451	206	384	2,186	4,548	1.340	1.530	13	16	153	197	91	17	26	200	304	92	7.2	8.8	16	58	0.27	0.64	3.02
May-01	173	227	227	2,269	2,753	238	556	2,755	9,042	1.240	1.800	17	20	184	270	90	16	22	170	242	93	7.3	7.8	48	74	0.24	0.38	2.48
June-01	162	217	233	2,103	2,962	258	406	2,416	3,759	1.090	1.390	10	15	94	165	94	15	19	144	203	94	6.9	8.0	21	50	0.22	0.45	2.00
July-01	181	208	244	2,032	2,177	219	300	1,787	2,502	0.960	1.120	6	7	49	55	97	14	17	115	174	93	6.9	7.4	24	109	0.31	0.59	2.48
August-01	206	300	287	2,526	4,247	285	390	2,471	4,001	1.240	1.500	11	15	112	149	95	23	26	236	306	92	6.8	7.4	30	67	0.33	0.49	3.41
September-01	177	192	256	2,205	2,431	255	330	2,159	2,697	1.280	1.530	9	11	100	148	95	17	21	191	259	93	6.8	7.4	5	31	0.30	0.51	3.20
October-01	151	237	193	1,941	2,137	203	340	1,990	3,261	1.130	1.950	11	14	115	235	93	27	47	289	619	87	6.8	7.3	18	75	0.24	0.58	2.26
November-01	184	240	263	2,868	3,890	230	278	2,381	3,430	1.220	1.580	10	16	108	205	95	29	53	321	681	87	6.8	7.1	18	49	0.25	0.41	2.54
December-01	162	312	184	2,713	3,815	204	344	2,923	4,293	1.830	2.380	13	15	205	296	92	26	29	408	672	87	7.0	7.7	15	102	0.34	0.59	5.19
January-02	158	221	196	2,682	2,980	199	282	2,855	5,174	1.630	2.890	15	17	211	376	91	31	38	468	940	84	7.2	7.7	10	44	0.31	0.53	4.21
February-02	16	19	32	475	618	10	12	154	239	2.010	3.030	16	18	245	393	90	33	39	504	683	83	7.3	7.7	25	85	0.23	0.36	3.86
March-02	16	32	33	475	761	37	50	590	842	1.780	2.730	16	24	262	459	89	37	44	590	842	86	7.5	7.8	29	100	0.28	0.36	4.16
April-02	174	211	236	2,599	2,759	275	512	3,104	6,320	1.390	1.940	13	19	145	205	93	28	36	322	380	90	7.4	8.1	10	108	0.29	0.46	3.36
May-02	199	531	260	2,461	2,657	296	466	2,891	4,392	1.220	1.460	15	26	157	290	92	24	50	244	527	92	7.4	8.1	3	6	0.32	0.46	3.26
June-02	211	259	264	2,318	2,917	295	434	2,667	4,491	1.120	1.280	7	8	63	93	97	11	14	103	169	96	7.4	7.8	3	4	0.34	0.49	3.18
July-02	218	381	260	2,219	2,362	275	400	2,349	3,336	1.090	1.740	9	12	90	218	96	11	14	109	247	96	7.1	7.8	2	3	0.33	0.57	3.00
August-02	174	262	232	2,027	2,329	500	1096	**4,432**	9,598	1.190	2.030	8	9	75	139	96	12	14	114	216	98	7.1	7.5	2	4	0.29	0.43	2.90
September-02	226	366	271	2,437	2,869	501	1224	**4,843**	13,781	1.120	1.470	9	11	88	156	96	15	19	151	264	97	6.5	7.2	28	247	0.18	0.54	1.70
October-02	196	232	254	2,088	2,600	266	454	2,459	6,550	1.030	1.320	6	9	53	101	97	13	18	107	155	95	6.5	7.0	4	44	0.26	0.56	2.23
November-02	181	225	266	2,113	2,916	231	368	1,868	3,008	1.000	1.290	9	11	75	101	95	21	30	181	254	91	6.8	7.5	4	13	0.33	0.66	2.75
December-02	183	235	256	2,595	3,174	274	388	2,709	3,405	1.340	1.760	10	12	113	161	95	29	35	326	470	89	7.3	8.1	3	5	0.31	0.49	3.50
January-03	167	194	235	2,752	3,361	235	340	2,773	3,745	1.610	1.870	12	16	163	214	92	18	23	243	315	91	7.6	8.1	3	7	0.31	0.37	4.20
February-03	185	235	240	2,218	2,553	271	392	2,593	3,760	1.190	1.540	17	20	168	281	91	28	39	285	462	90	7.7	8.4	2	3	0.32	0.44	3.18
March-03	165	181	215	2,039	2,185	205	248	1,989	2,379	1.240	1.550	18	24	189	333	89	24	35	251	477	88	8.0	8.6	2	2	0.31	0.43	3.21
April-03	180	237	249	2,466	2,669	189	260	1,886	2,711	1.330	1.630	21	22	225	262	88	25	33	280	504	87	8.0	8.4	6	13	0.25	0.32	2.77
May-03	178	253	274	2,608	3,271	221	336	2,114	3,195	1.170	1.340	13	22	128	222	93	13	22	127	222	94	7.6	8.3	5	11	0.31	0.46	3.02
June-03	183	227	237	2,244	2,743	240	316	2,288	3,400	1.120	1.320	6	7	59	85	97	11	12	101	127	96	7.9	8.1	3	6	0.32	0.58	2.99
July-03	200	236	226	1,927	2,151	196	228	1,662	1,998	0.970	1.330	9	12	69	118	96	13	19	101	155	93	7.6	8.1	2	4	0.24	0.38	1.94
August-03	216	277	286	2,584	2,854	215	288	1,949	2,642	1.140	2.090	7	10	67	105	97	12	13	108	139	95	7.1	7.6	6	25	0.21	0.71	2.00
September-03	168	241	303	3,020	5,065	230	348	2,249	3,657	1.620	3.180	9	11	110	173	95	21	23	260	402	91	7.0	7.4	10	23	0.24	0.65	3.24
October-03	210	276	281	2,597	3,114	257	428	2,362	3,641	1.330	1.990	11	16	122	176	94	21	28	232	341	90	7.3	7.9	20	133	0.26	0.46	2.88
November-03	178	243	257	2,737	2,973	237	324	2,718	4,025	1.450	2.490	12	17	165	353	93	23	30	318	851	91	7.5	7.9	18	88	0.30	0.62	3.63
December-03	194	274	209	2,383	3,292	232	392	2,742	4,512	1.600	2.100	14	16	186	236	93	18	21	241	354	92	7.5	7.8	90	272	0.30	0.37	4.00
January-04	164	233	197	3,117	3,727	198	300	3,099	5,014	1.980	2.710	23	31	347	517	86	33	63	498	1021	83	7.2	7.7	79	163	0.33	0.49	5.40
February-04	161	199	196	2,518	2,748	176	220	2,227	2,769	1.560	2.230	15	17	204	266	90	21	26	269	360	88	7.2	7.7	27	82	0.39	0.54	5.10
March-04	194	243	266	3,404	4,678	255	312	3,138	4,450	1.580	2.150	13	14	167	244	94	15	19	196	264	94	7.3	7.6	37	136	0.34	0.61	4.50
April-04	204	270	230	2,507	3,016	285	536	3,046	5,409	1.280	1.400	13	17	143	200	93	11	13	118	163	96	6.9	7.7	11	47	0.30	0.56	3.20
May-04	235	432	316	3,265	4,105	325	496	3,316	4,881	1.420	1.870	13	15	149	220	94	18	24	203	261	94	7.0	7.6	26	79	0.31	0.60	3.70
June-04	210	265	255	2,777	3,719	328	392	3,543	4,871	1.380	1.670	9	12	110	188	96	15	19	178	242	95	7.2	7.7	12	30	0.25	0.48	2.90
July-04	219	273	289	2,629	3,189	322	488	2,966	4,477	1.170	1.390	7	8	68	123	97	11	12	110	132	97	6.9	7.5	25	52	0.25	0.44	2.40
August-04	130	200	148	1,991	2,235	194	328	2,674	4,377	1.710	2.900	8	11	123	263	87	14	15	216	479	87	6.9	7.4	33	252	0.31	0.70	4.42
September-04	142	167	177	2,229	2,439	210	396	2,829	7,101	1.370	1.890	8	11	96	204	94	16	23	189	327	92	6.9	7.6	15	252	0.30	0.69	3.40
October-04	182	290	241	2,320	2,809	249	328	2,402	3,156	1.220	1.600	9	12	99	139	95	24	29	267	403	90	6.7	7.6	17	44	0.31	0.56	3.20
November-04	176	220	281	3,984	6,165	248	300	3,368	5,073	1.580	2.100	8	9	120	158	95	24	27	350	508	89	7.1	7.7	83	227	0.28	0.54	3.70
since 4/00: AVE:	179	250	234	2390	3007	246	400	2513	4363	1.333	1.832	12	15	135	214	93	20	26	228	372	92	7.2	7.8	17	65	0.30	0.51	3.33
MIN:	16	19	32	475	618	10	12	154	239	0.960	1.120	6	7	49	55	86	11	12	101	127	83	6.5	7.0	2	2	0.18	0.32	1.70
MAX:	253	540	316	3984	6906	501	1224	4843	13781	2.010	3.180	23	31	347	517	97	37	63	590	1021	98	8.0	8.8	90	272	0.41	0.71	5.40
LIMIT:				3,570				3,188		2.125		25	40	521	782	85	75	110	1564	2294	65	6.0	9.0	200	400	0.50	0.75	10.40
DESIGN:				4,200				3,750		2.500																				

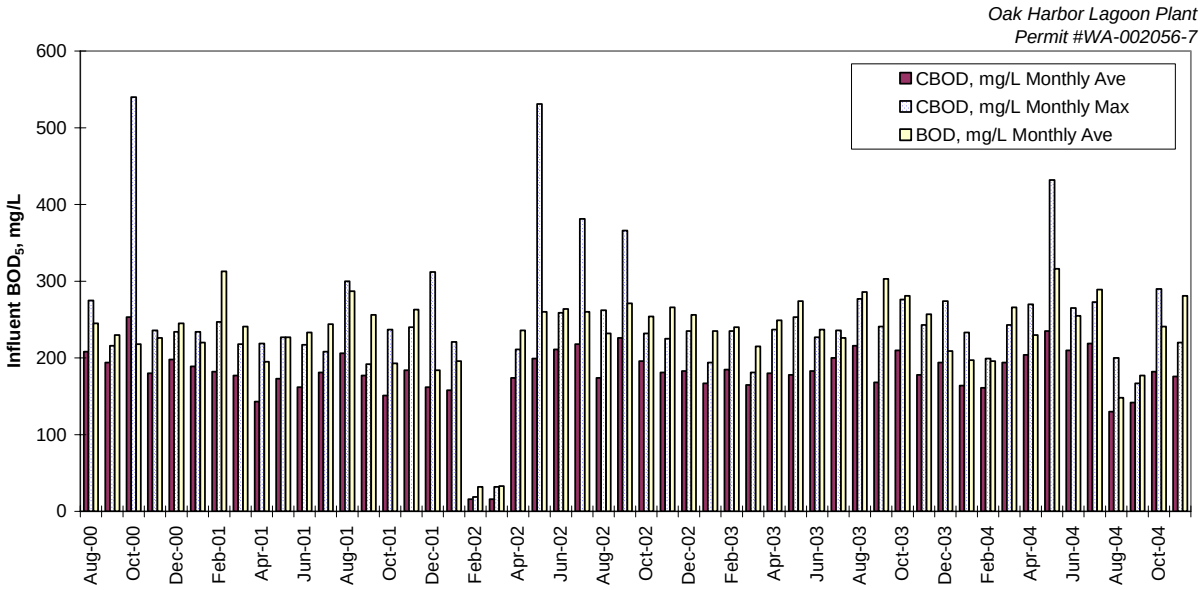
approaching design limits (85%)
exceeds permit/design limits

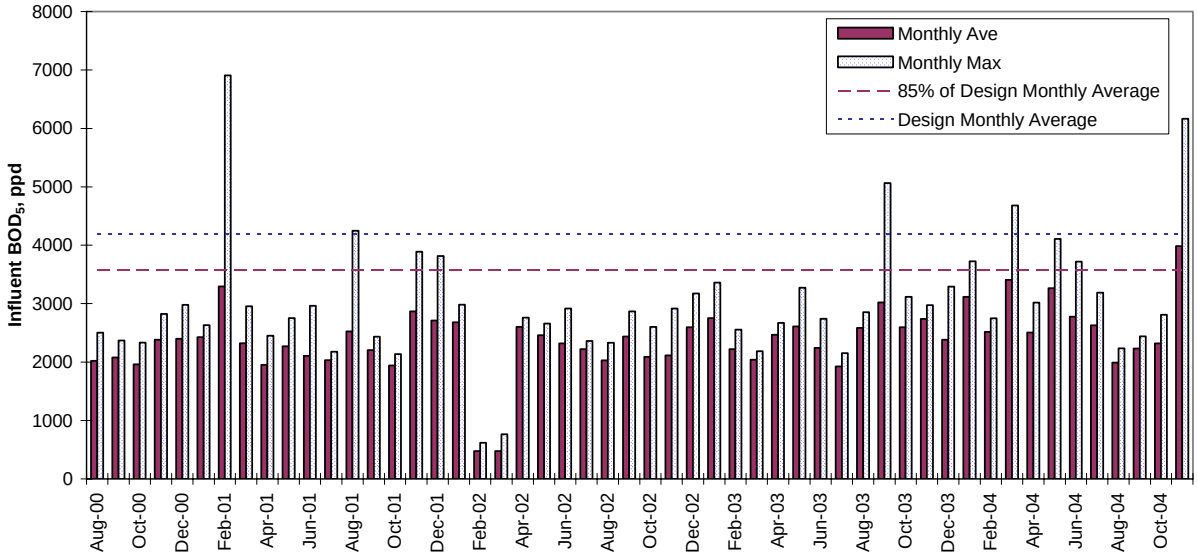
Discharge Monitoring Data, Flow and Effluent pH, 2000-2004



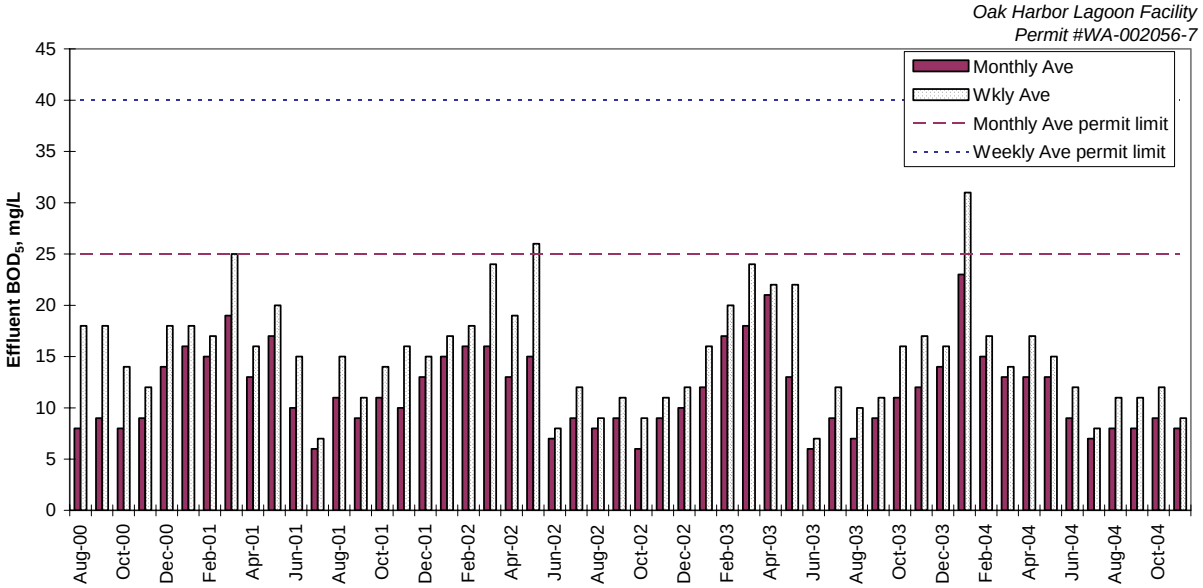


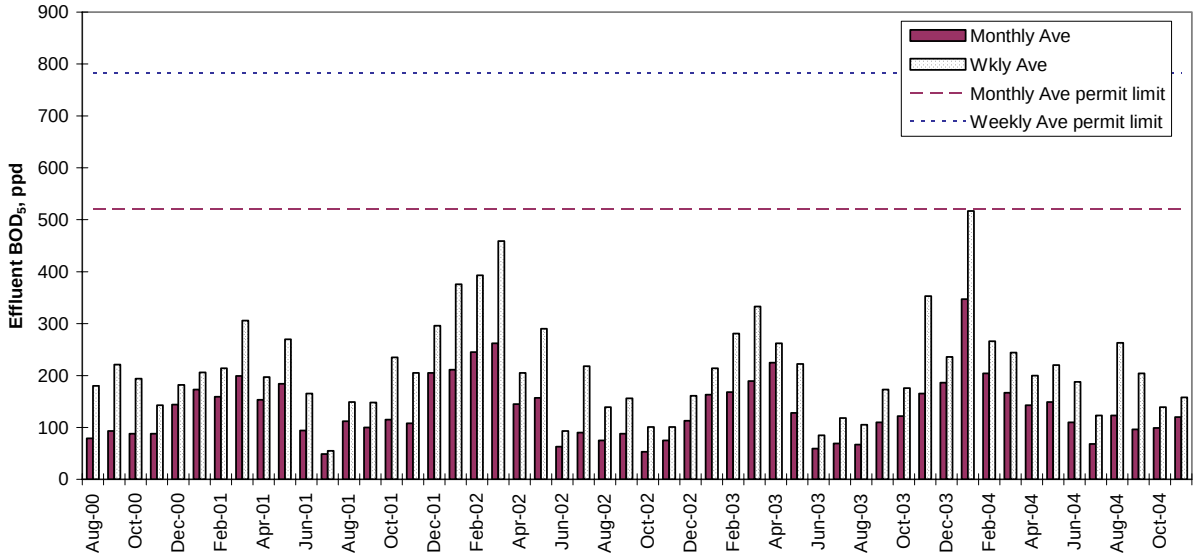
Discharge Monitoring Data, Influent BOD5, 2000-2004



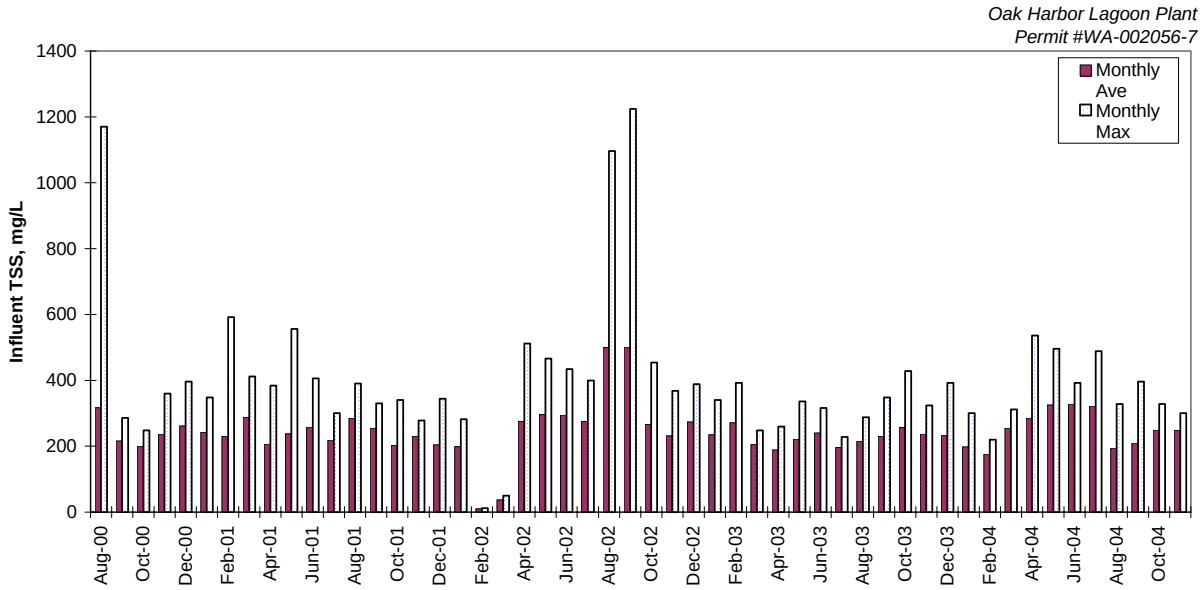


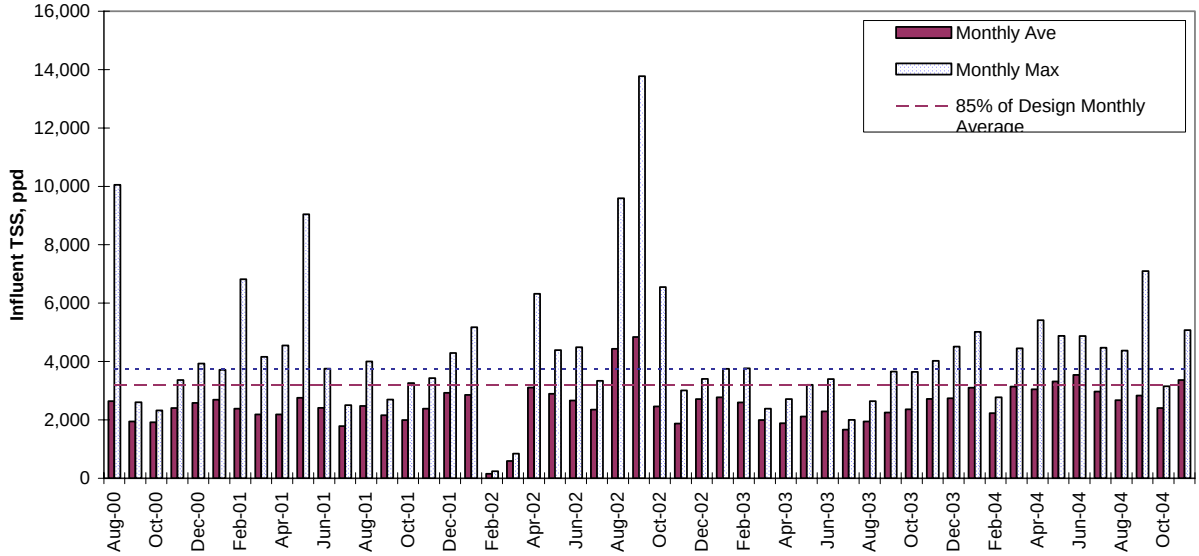
Discharge Monitoring Data, Effluent BOD5, 2000-2004



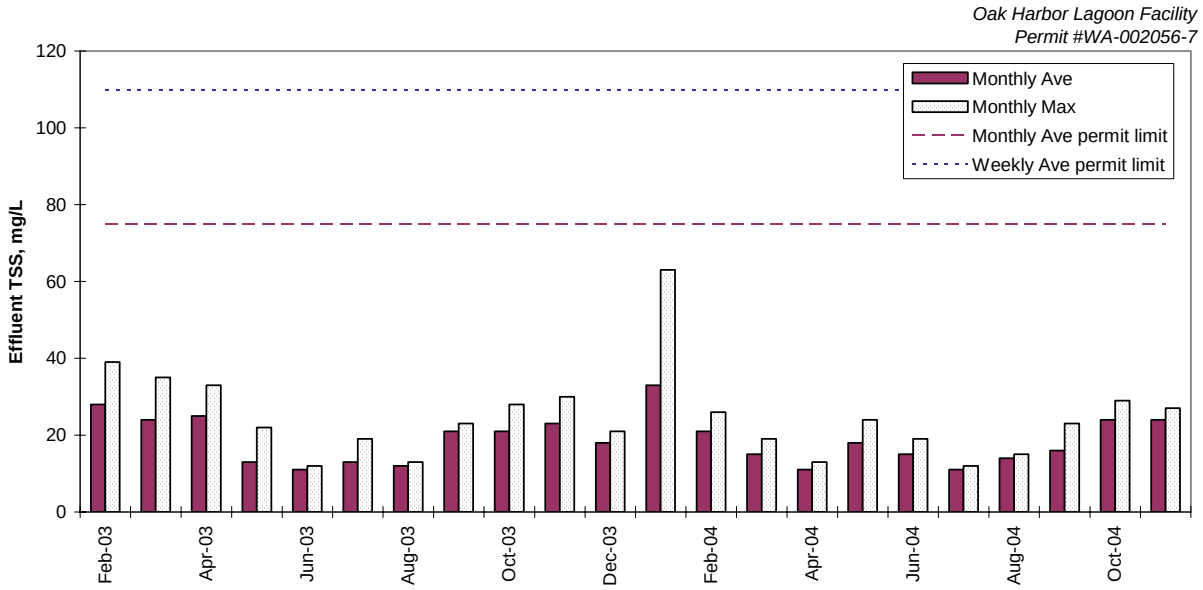


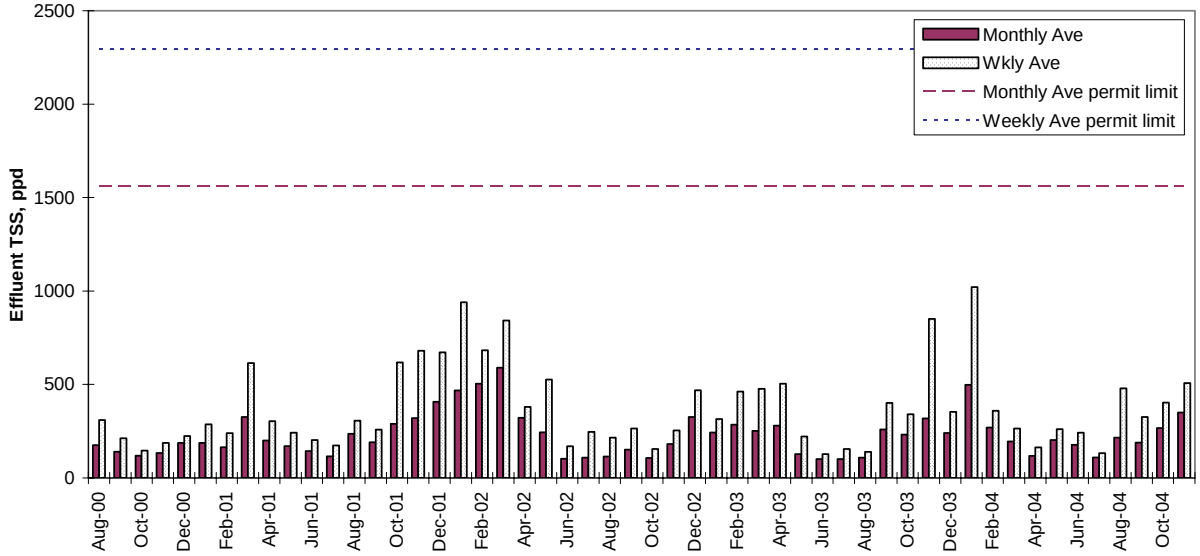
Discharge Monitoring Data, Influent TSS, 2000-2004





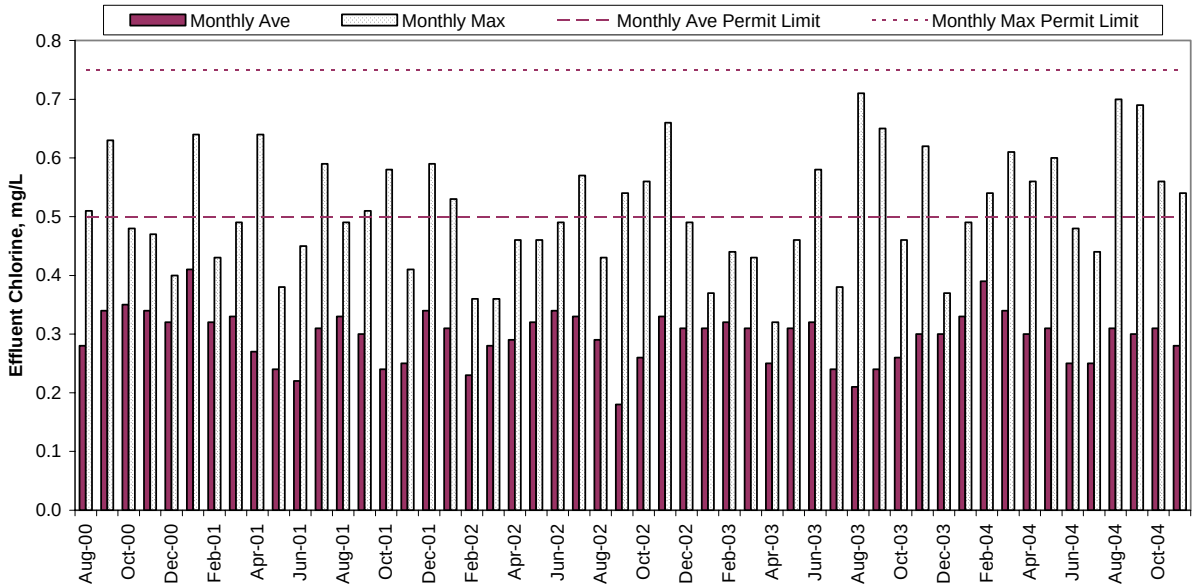
Discharge Monitoring Data, Effluent TSS, 2000-2004

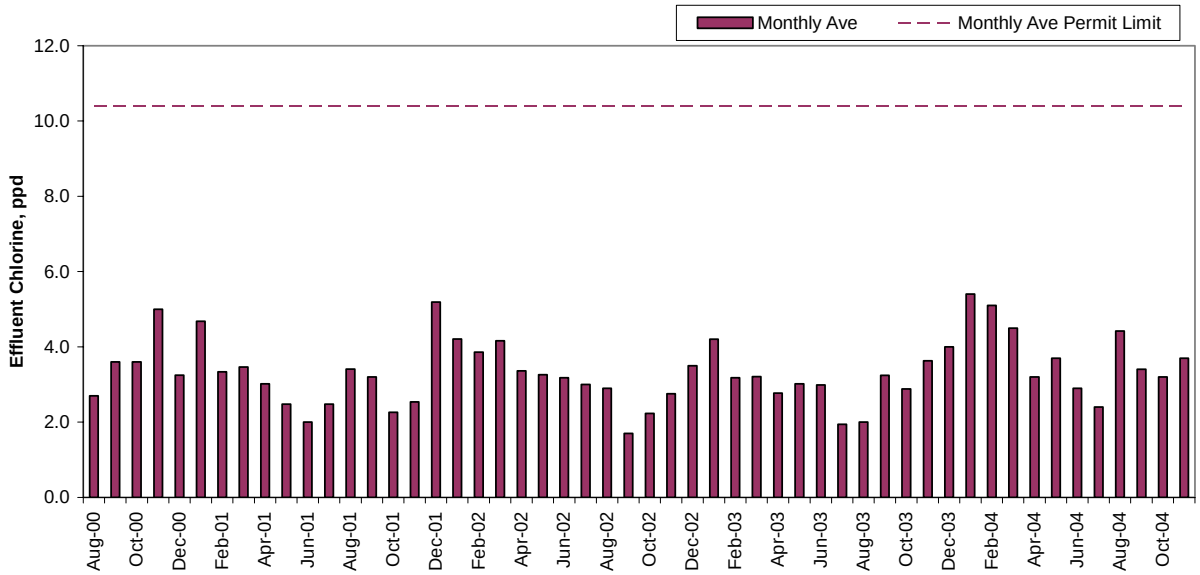




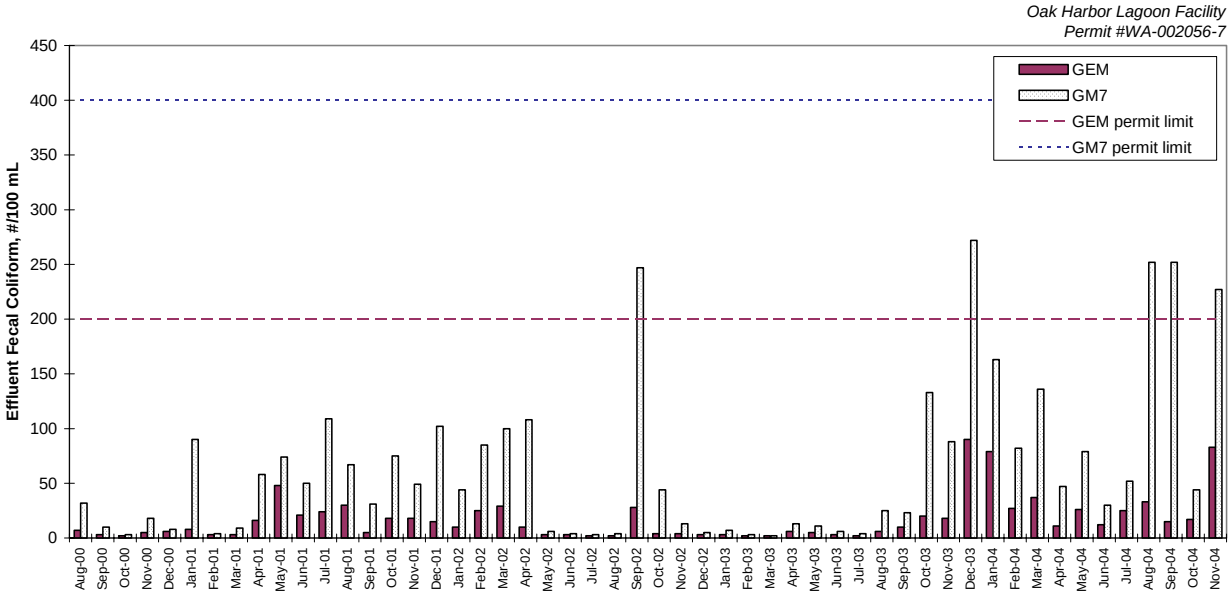
Discharge Monitoring Data, Residual Chlorine, 2000-2004

Oak Harbor Lagoon Facility
Permit #WA-002056-7





Discharge Monitoring Data, Effluent Fecal Coliform, 2000-2004



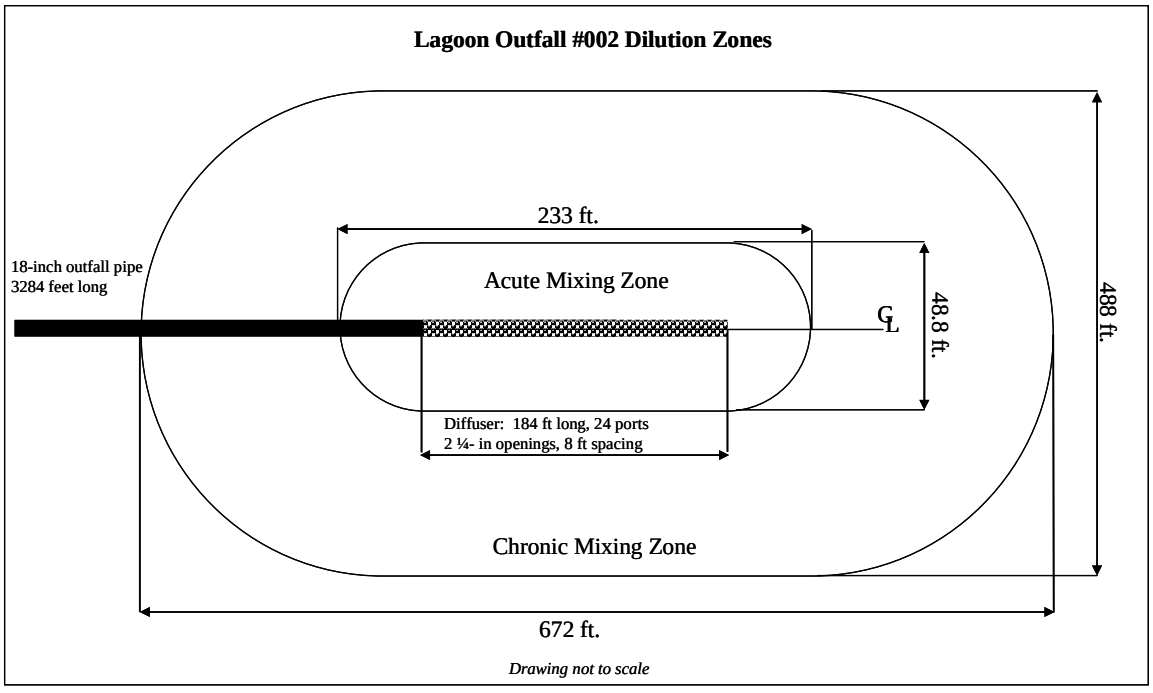
APPENDIX H—OUTFALL DILUTION EVALUATION

Mixing Zone Size

Mixing zones are authorized for compliance with water quality standards in accordance with restrictions established in Chapter 173-201A-400 WAC. Restrictions include geometric limitations based on the size and configuration of the outfall diffuser, as well as dimensions of the receiving water body. As defined in 173-201A-400 (7)(b) WAC, the maximum chronic mixing zone size is limited as follows:

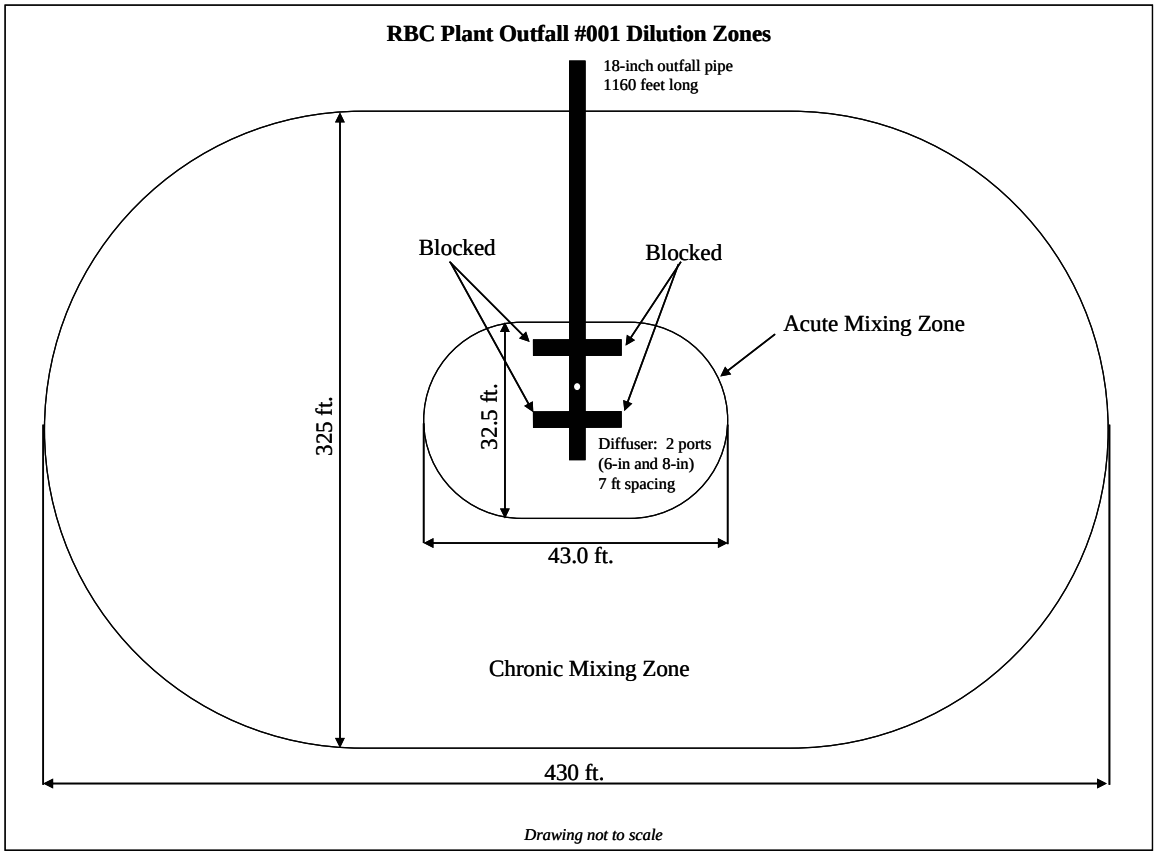
> "Shall not extend in any horizontal direction from the discharge port(s) for a distance greater than two hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water (MLLW)"
>
> *and*
>
> "Not occupy greater than twenty-five percent of the width of the water body as measured during mean lower low water (MLLW)."

For Outfall #002, the receiving water body, Crescent Harbor, is large enough to not require minimizing the chronic mixing zone based on the 25% of waterbody width criteria. Given the MLLW depth of 44 feet, the chronic mixing zone for Outfall #002 will be allowed to have a maximum radius of 244 feet from any point along the length of the diffuser. Based on a total diffuser length of 184 feet, the allowable chronic mixing zone will be elliptical in shape, with total length of: 184 ft + 2 x 244 ft = 672 ft; width will be 2 x 244 ft = 488 ft. The zone of acute criteria exceedance can occupy 10% of the chronic mixing zone area. Therefore, the acute mixing zone will have an allowable length of 233 ft (2 x 24.4 ft + 184 ft) and an allowable width of 48.8 ft. The size of both mixing zones is approximated in the following illustration.



As was outlined in the fact sheet for the last permit, the maximum chronic mixing zone is restricted based on the width of the receiving water body. Based on scaled measurements from a USGS quadrangle map of Oak Harbor, the width of the water body at the diffuser is 1300 feet at low tide. Therefore, the chronic mixing zone is allowed to occupy no more than 325 feet of the waterbody's width. As the outfall is oriented roughly perpendicular to the constricted water body, the size restriction applies only to the length along the diffuser's axis.

Based on the 2001 outfall evaluation, the lateral arms or the diffuser are currently blocked with sediment and are effectively useless. As a result, the mixing zone radius perpendicular to the diffuser will not allow for the length of these arms. Given the 15-foot MLLW depth, the allowable radius perpendicular to the diffuser is 215 feet. The total size of the mixing zone will be 325 feet along the axis of the diffuser and 430 feet perpendicular to the diffuser; the acute zone is 32.5 feet by 43.0 feet. The following illustration diagrams the approximate size and orientation of the allowable mixing zones.



Dilution modeling, Outfall #001

The blockage for four ports on Outfall #001 required reassessment of the diffuser's mixing behavior with computer modeling. EPA's Visual Plumes model was used to conduct this evaluation. However, the existing configuration is atypical of the conventional diffuser configurations that the model is designed to model. The model assumes that all diffuser ports are equally-sized, equally-spaced and discharge at the same angle relative to the bottom of the

receiving water. This is not the case with the Outfall #001's diffuser, which has two ports of unequal size discharging in different angles.

Accommodating for the differences required the creation of a theoretical synthetic diffuser that approximates the flows from the two different ports as though they were flowing from two similar ports. Assumptions made in the creation of the synthetic diffuser were: 1) the lateral ports are fully inaccessible to discharge flow, 2) flow energy at each port are equal, and 3) the actual discharge can be adequately approximated using two theoretical ports. The proposed theoretical ports will have openings with areas equal to the average area of the existing ports and are oriented at an angle equal to the vector-averaged angle of the existing ports.

The original diffuser design utilized a modified "H" configuration with four horizontal 8-inch ports discharging perpendicular to the axis of the diffuser, one 6-inch port/opening discharging vertically from the top-center of the diffuser and an 8-inch port discharging horizontally at the end of the diffuser (see illustration in above discussion of mixing zone size for port layout). Based on the 2001 outfall inspection, the lateral 8-inch ports are now blocked with sediment, preventing discharge from those openings. The remaining 6-inch and 8-inch ports leave a total area of approximately 0.545 ft^2 available for discharge flow. Therefore, the proposed theoretical diffuser will utilize two ports with an average opening area of 0.27 ft^2 and a resulting diameter of 7.07 inches.

Flow energy balance calculations indicate that nearly 2/3 of the total diffuser flow is discharged through the end 8-inch port (horizontal discharge); the remaining 1/3 exits through the top 6-inch port (vertical discharge). The resulting vector-averaged discharge angle, based on flow volume, is 29 degrees above horizontal.

Synthetic diffuser design parameters used for analysis of Outfall #001 are as follows:

Parameter	Approximated Value
Number of ports	2
Spacing between ports	7 feet
Port Diameter	7.07 inches
Discharge angle	29.36 degrees above horizontal
Discharge elevation	4 inches above bottom
Port depth	15 feet MLLW
Approximate discharge direction	136° (W-SW orientation)

Output data from the Visual Plumes model runs at various oceanographic and process conditions are shown in the following tables. The data shows that worst-case mixing conditions occur during winter conditions and will result in dilution ratios of 50:1 (chronic) and 19:1 (acute).

Plumes Model data—RBC Facility

Winter season, current average flow rate
/ Windows UM3. 1/5/2005 11:27:03 AM
Case 1; ambient file Z:\WWTP\Oak Harbor\RBC Plant\RBC Eval.001.db; Diffuser table record 3: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	25	21.99	6.51	0	0	0.03	0	0.0003
1	0.03	25	22.47	7.34	0	0	0.03	0	0.0003
2	0.03	25	25.98	9.24	0	0	0.03	0	0.0003
3	0.03	25	26.78	9.42	0	0	0.03	0	0.0003
4	0.03	25	26.69	9.41	0	0	0.03	0	0.0003
5	0.03	25	26.6	9.4	0	0	0.03	0	0.0003
6	0.03	25	26.52	9.39	0	0	0.03	0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(N-deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
7.07	4	29.36	136	2	7	44	325	15	0.5	0.05	15	100

Froude number: 2.229

	Depth	Amb-cur	P-dia	Incrmnt	Ttl-flo	Temp	Polutnt	4/3Eddy	Dilutn	x-posn	y-posn	Time	
Step	(ft)	(m/s)	(in)	(s)	(MGD)	(C)	(ppm)	(ppm)	()	(ft)	(ft)	(s)	
0	15	0.03	7.07	3600	0.5	15	100	100	1	0	0	0.0;	
100	11	0.03	26.99	3600	0.5	10.18	13.83	13.83	7.099	1.982	-1.515	5.903;	
152	5.207	0.03	52.44	3600	0.5	9.581	4.939	4.939	19.85	3.472	-1.835	15.82;	axial vel 0.0321 trap level,
158	4.296	0.03	60.1	3600	0.5	9.44	4.386	4.386	22.35	3.73	-1.837	17.89;	merging,
166	3.5	0.03	78.44	3600	0.5	9.307	4.031	4.031	24.32	4.009	-1.831	20.19;	begin overlap,
200	2.82	0.03	143.5	3600	0.5	9.233	3.877	3.877	25.29	4.393	-1.815	23.41;	
247	2.67	0.03	201.8	3600	0.5	9.225	3.861	3.861	25.39	4.599	-1.805	25.14;	surface,

4/3 Power Law. Farfield dispersion based on wastefield width of 5.86 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
4.25E-02	52.78	36.75	99.06	0.903	0	0	0.03	3.00E-04

count: 1
11:27:03 AM. amb fills: 2

Winter season, design flow rate
/ Windows UM3. 1/5/2005 11:27:14 AM
Case 1; ambient file Z:\WWTP\Oak Harbor\RBC Plant\RBC Eval.001.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	25	21.99	6.51	0	0	0.03	0	0.0003
1	0.03	25	22.47	7.34	0	0	0.03	0	0.0003
2	0.03	25	25.98	9.24	0	0	0.03	0	0.0003
3	0.03	25	26.78	9.42	0	0	0.03	0	0.0003
4	0.03	25	26.69	9.41	0	0	0.03	0	0.0003
5	0.03	25	26.6	9.4	0	0	0.03	0	0.0003
6	0.03	25	26.52	9.39	0	0	0.03	0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(N-deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
7.07	4	29.36	136	2	7	44	325	15	0.7	0.05	15	100

Froude number: 3.12

	Depth	Amb-cur	P-dia	Incrmnt	Ttl-flo	Temp	Polutnt	4/3Eddy	Dilutn	x-posn	y-posn	Time	
Step	(ft)	(m/s)	(in)	(s)	(MGD)	(C)	(ppm)	(ppm)	()	(ft)	(ft)	(s)	
0	15	0.03	7.07	3600	0.7	15	100	100	1	0	0	0.0;	
100	10.76	0.03	30.84	3600	0.7	10.18	13.8	13.8	7.113	2.49	-2.034	5.831;	
147	5.015	0.03	56.63	3600	0.7	9.599	5.442	5.442	18.01	4.173	-2.642	15.08;	axial vel 0.0392 trap level,
154	3.884	0.03	66.77	3600	0.7	9.411	4.738	4.738	20.69	4.525	-2.697	17.5;	merging,
162	3.146	0.03	83.91	3600	0.7	9.283	4.408	4.408	22.25	4.81	-2.732	19.54;	begin overlap,
200	2.334	0.03	151.4	3600	0.7	9.2	4.23	4.23	23.18	5.32	-2.782	23.27;	
223	2.222	0.03	181.3	3600	0.7	9.195	4.218	4.218	23.25	5.467	-2.796	24.35;	axial vel 0.0821 surface,

4/3 Power Law. Farfield dispersion based on wastefield width of 5.33 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
4.68E-02	**49.56**	35.63	99.06	0.9	0	0	0.03	3.00E-04

count: 1 ***Worst Case Chronic***
11:27:14 AM. amb fills: 2

Winter season, peak flow rate

/ Windows UM3. 1/5/2005 11:27:22 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\RBC Plant\RBC Eval.002.db; Diffuser table record 5: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	25	21.99	6.51	0	0	0.03	25	0.0003
1	0.03	25	22.47	7.34	0	0	0.03	25	0.0003
2	0.03	25	25.98	9.24	0	0	0.03	25	0.0003
3	0.03	25	26.78	9.42	0	0	0.03	25	0.0003
4	0.03	25	26.69	9.41	0	0	0.03	25	0.0003
5	0.03	25	26.6	9.4	0	0	0.03	25	0.0003
6	0.03	25	26.52	9.39	0	0	0.03	25	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(N-deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
7.07	4	29.36	136	2	7	44	325	15	1.9	0.05	15	100

Froude number: 8.47

	Depth	Amb-cur	P-dia	Incrmnt	Ttl-flo	Temp	Polutnt	4/3Eddy	Dilutn	x-posn	y-posn	Time	
Step	(ft)	(m/s)	(in)	(s)	(MGD)	(C)	(ppm)	(ppm)	()	(ft)	(ft)	(s)	
0	15	0.03	7.07	3600	1.9	15	100	100	1	0	0	0.0;	
100	10.61	0.03	42.76	3600	1.9	10.18	13.8	13.8	7.113	4.092	-3.8	4.431;	
139	4.732	0.03	75.5	3600	1.9	9.65	6.376	6.376	15.38	7.173	-5.991	12.63;	trap level,
143	3.918	0.03	82.12	3600	1.9	9.533	5.891	5.891	16.65	7.563	-6.221	14.02;	merging,
156	2.272	0.03	110.4	3600	1.9	9.314	5.269	5.269	18.61	8.498	-6.741	17.55;	axial vel 0.148 begin overla
172	1.512	0.03	137.1	3600	1.9	9.237	5.093	5.093	**19.26**	9.104	-7.064	19.95;	surface,

4/3 Power Law. Farfield dispersion based on wastefield width of 4.21 m ***Worst Case Acute***

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
5.64E-02	43.68	32.83	99.06	0.885	0	0	0.03	3.00E-04

count: 1

11:27:22 AM. amb fills: 2

Summer season, current average flow rate

/ Windows UM3. 1/5/2005 11:27:32 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\RBC Plant\RBC Eval.002.db; Diffuser table record 4: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	25	26.71	15.69	0	0	0.03	0	0.0003
1	0.03	25	26.15	15.53	0	0	0.03	0	0.0003
2	0.03	25	27.22	14.59	0	0	0.03	0	0.0003
3	0.03	25	27.54	13.99	0	0	0.03	0	0.0003
4	0.03	25	27.83	13.55	0	0	0.03	0	0.0003
5	0.03	25	28.18	13	0	0	0.03	0	0.0003
6	0.03	25	28.5	12.79	0	0	0.03	0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(N-deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
7.07	4	29.36	136	2	7	44	325	15	0.5	0.05	20.7	100

Froude number: 2.155

	Depth	Amb-cur	P-dia	Incrmnt	Ttl-flo	Temp	Polutnt	4/3Eddy	Dilutn	x-posn	y-posn	Time	
Step	(ft)	(m/s)	(in)	(s)	(MGD)	(C)	(ppm)	(ppm)	()	(ft)	(ft)	(s)	
0	15	0.03	7.07	3600	0.5	20.7	100	100	1	0	0	0.0;	
100	11.02	0.03	26.73	3600	0.5	14.55	13.92	13.92	7.044	1.937	-1.485	5.743;	
160	4.017	0.03	58.69	3600	0.5	14.5	4.244	4.244	23.07	3.746	-1.809	18.2;	axial vel 0.0433 merging,
162	3.625	0.03	61.34	3600	0.5	14.53	4.079	4.079	24.01	3.854	-1.806	19.1;	trap level,
174	0.635	0.03	96.3	3600	0.5	14.75	3.216	3.216	30.45	4.826	-1.735	27.44;	axial vel 0.325 trap level,

4/3 Power Law. Farfield dispersion based on wastefield width of 3.18 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
1.71E-02	75.87	31.43	99.06	0.903	0	0	0.03	3.00E-04

count: 1

11:27:32 AM. amb fills: 2

Summer season, design flow rate

/ Windows UM3. 1/5/2005 11:27:47 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\RBC Plant\RBC Eval.001.db; Diffuser table record 2: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	25	21.99	6.51	0	0	0.03	0	0.0003
1	0.03	25	22.47	7.34	0	0	0.03	0	0.0003
2	0.03	25	25.98	9.24	0	0	0.03	0	0.0003
3	0.03	25	26.78	9.42	0	0	0.03	0	0.0003
4	0.03	25	26.69	9.41	0	0	0.03	0	0.0003
5	0.03	25	26.6	9.4	0	0	0.03	0	0.0003
6	0.03	25	26.52	9.39	0	0	0.03	0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(N-deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
7.07	4	29.36	136	2	7	44	325	15	0.7	0.05	20.7	100

Froude number: 3.045

	Depth	Amb-cur	P-dia	Incrmnt	Ttl-flo	Temp	Polutnt	4/3Eddy	Dilutn	x-posn	y-posn	Time	
Step	(ft)	(m/s)	(in)	(s)	(MGD)	(C)	(ppm)	(ppm)	()	(ft)	(ft)	(s)	
0	15	0.03	7.07	3600	0.7	20.7	100	100	1	0	0	0.0;	
100	10.75	0.03	30.57	3600	0.7	10.97	13.8	13.8	7.107	2.455	-2.008	5.736;	
147	5.019	0.03	55.98	3600	0.7	9.909	5.442	5.442	18	4.102	-2.603	14.78;	axial vel 0.0396 trap level,
155	3.724	0.03	67.63	3600	0.7	9.646	4.648	4.648	21.07	4.499	-2.664	17.53;	merging,
162	3.078	0.03	83.1	3600	0.7	9.516	4.367	4.367	22.43	4.746	-2.693	19.3;	begin overlap,
200	2.202	0.03	153.2	3600	0.7	9.412	4.17	4.17	23.49	5.282	-2.743	23.24;	axial vel 0.0841
218	2.101	0.03	178.2	3600	0.7	9.406	4.159	4.159	23.55	5.406	-2.754	24.15;	surface,

4/3 Power Law. Farfield dispersion based on wastefield width of 5.26 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
4.50E-02	50.43	35.49	99.06	0.9	0	0	0.03	3.00E-04

count: 1

11:27:48 AM. amb fills: 2

Summer Season, peak flow rate

/ Windows UM3. 1/5/2005 11:27:53 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\RBC Plant\RBC Eval.002.db; Diffuser table record 6: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	25	26.71	15.69	0	0	0.03	0	0.0003
1	0.03	25	26.15	15.53	0	0	0.03	0	0.0003
2	0.03	25	27.22	14.59	0	0	0.03	0	0.0003
3	0.03	25	27.54	13.99	0	0	0.03	0	0.0003
4	0.03	25	27.83	13.55	0	0	0.03	0	0.0003
5	0.03	25	28.18	13	0	0	0.03	0	0.0003
6	0.03	25	28.5	12.79	0	0	0.03	0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(N-deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
7.07	4	29.36	136	2	7	44	325	15	1.9	0.05	20.7	100

Froude number: 8.187

	Depth	Amb-cur	P-dia	Incrmnt	Ttl-flo	Temp	Polutnt	4/3Eddy	Dilutn	x-posn	y-posn	Time	
Step	(ft)	(m/s)	(in)	(s)	(MGD)	(C)	(ppm)	(ppm)	()	(ft)	(ft)	(s)	
0	15	0.03	7.07	3600	1.9	20.7	100	100	1	0	0	0.0;	
100	10.6	0.03	42.63	3600	1.9	14.55	13.8	13.8	7.106	4.066	-3.776	4.399;	
144	3.666	0.03	80.95	3600	1.9	14.53	5.775	5.775	16.96	7.612	-6.24	14.26;	merging,
153	0.753	0.03	99.55	3600	1.9	14.69	4.833	4.833	20.27	8.933	-6.948	19.45;	axial vel 0.502 surface,

4/3 Power Law. Farfield dispersion based on wastefield width of 3.26 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
4.03E-02	49.67	30.9	99.06	0.885	0	0	0.03	3.00E-04

count: 1

11:27:53 AM. amb fills: 2

Dilution modeling, Outfall #002

Dilution modeling of the Lagoon Facility outfall was based on data supplied in the 1995 Mixing Zone Study. Design parameters used for the evaluation are summarized in the following table.

Parameter	Value
Number of ports	24
Spacing between ports	8 feet
Port Diameter	2.25 inches
Discharge angle	90 degrees (vertical)
Discharge elevation	18 inches above bottom
Port depth	44 feet MLLW

Modeling evaluated plume behavior with summer and winter ambient receiving water characteristics and at normal, design and peak wastewater flows. As indicated in the following data sets, worst case mixing conditions were predicted to occur in the winter season and will result in dilutions ratios of 138:1 (chronic) and 97:1 (acute).

Plumes Model Data—Lagoon Facility

Winter season, current average flow rate
/ Windows UM3. 1/13/2005 10:53:19 AM
Case 1; ambient file Z:\WWTP\Oak Harbor\Lagoon Plant\outfall analysis.001.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	-200	22.22	6.44	0	0	0.03	290	0.0003
1	0.03	-200	23.78	7.54	0	0	0.03	290	0.0003
2	0.03	-200	24.4	8.22	0	0	0.03	290	0.0003
3	0.03	-200	26.14	8.71	0	0	0.03	290	0.0003
4	0.03	-200	27.14	8.88	0	0	0.03	290	0.0003
5	0.03	-200	27.87	9.11	0	0	0.03	290	0.0003
6	0.03	-200	28.53	9.3	0	0	0.03	290	0.0003
7	0.03	-200	28.91	9.45	0	0	0.03	290	0.0003
8	0.03	-200	29.11	9.51	0	0	0.03	290	0.0003
9	0.03	-200	29.45	9.54	0	0	0.03	290	0.0003
10	0.03	-200	29.59	9.57	0	0	0.03	290	0.0003
11	0.03	-200	29.76	9.59	0	0	0.03	290	0.0003
12	0.03	-200	29.89	9.61	0	0	0.03	290	0.0003
13	0.03	-200	29.94	9.62	0	0	0.03	290	0.0003
14	0.03	-200	29.92	9.62	0	0	0.03	290	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
2.25	18	90	70	24	8	24.4	244	44	1.3	0.05	7.8	100

Froude number: 8.127

	Depth	Amb-cur	P-dia	Incrmnt	Polutnt	4/3Eddy	P-speed	Dilutn	x-posn	y-posn	
Step	(ft)	(m/s)	(in)	(s)	(ppm)	(ppm)	(m/s)	()	(ft)	(ft)	
0	44	0.03	2.25	3600	100	100	0.925	1	0	0.0;	
100	41.48	0.03	12.62	3600	13.8	13.8	0.207	7.103	-0.172	0.0626;	
200	32.93	0.03	47.54	3600	1.905	1.905	0.106	51.33	-1.904	0.693;	
233	27.99	0.03	78.19	3600	0.991	0.991	0.0742	98.65	-3.542	1.289;	axial vel 0.00432 trap level,
245	26.47	0.03	97.26	3600	0.813	0.813	0.0585	120.3	-4.263	1.552;	merging,
249	26.19	0.03	103.5	3600	0.781	0.781	0.0548	125.2	-4.432	1.613;	begin overlap,
300	24.68	0.03	170	3600	0.689	0.689	0.0336	141.9	-5.832	2.123;	
348	24.49	0.03	192.5	3600	0.683	0.683	0.0298	143.2	-6.552	2.385;	local maximum rise or fall,

4/3 Power Law. Farfield dispersion based on wastefield width of 24.07 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
7.76E-03	186	53.04	74.37	0.669	0	0	0.03	3.00E-04

count: 1
10:53:21 AM. amb fills: 2

Winter season, design flow rate
/ Windows UM3. 1/13/2005 10:53:31 AM
Case 1; ambient file Z:\WWTP\Oak Harbor\Lagoon Plant\outfall analysis.001.db; Diffuser table record 2: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	-200	22.22	6.44	0	0	0.03	290	0.0003
1	0.03	-200	23.78	7.54	0	0	0.03	290	0.0003
2	0.03	-200	24.4	8.22	0	0	0.03	290	0.0003
3	0.03	-200	26.14	8.71	0	0	0.03	290	0.0003
4	0.03	-200	27.14	8.88	0	0	0.03	290	0.0003
5	0.03	-200	27.87	9.11	0	0	0.03	290	0.0003
6	0.03	-200	28.53	9.3	0	0	0.03	290	0.0003
7	0.03	-200	28.91	9.45	0	0	0.03	290	0.0003
8	0.03	-200	29.11	9.51	0	0	0.03	290	0.0003
9	0.03	-200	29.45	9.54	0	0	0.03	290	0.0003
10	0.03	-200	29.59	9.57	0	0	0.03	290	0.0003
11	0.03	-200	29.76	9.59	0	0	0.03	290	0.0003
12	0.03	-200	29.89	9.61	0	0	0.03	290	0.0003
13	0.03	-200	29.94	9.62	0	0	0.03	290	0.0003
14	0.03	-200	29.92	9.62	0	0	0.03	290	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
2.25	18	90	70	24	8	24.4	244	44	2.5	0.05	7.8	100

Froude number: 15.63

	Depth	Amb-cur	P-dia	Incrmnt	Polutnt	4/3Eddy	P-speed	Dilutn	x-posn	y-posn	
Step	(ft)	(m/s)	(in)	(s)	(ppm)	(ppm)	(m/s)	()	(ft)	(ft)	
0	44	0.03	2.25	3600	100	100	1.779	1	0	0.0;	
100	41.26	0.03	14.51	3600	13.8	13.8	0.3	7.103	-0.121	0.044;	axial vel 0.0022
200	29.61	0.03	61.61	3600	1.905	1.905	0.121	51.33	-2.064	0.751;	
216	26.45	0.03	79.9	3600	1.388	1.388	0.0976	70.46	-2.902	1.056;	axial vel 0.00614 trap level,
225	24.6	0.03	96.56	3600	1.162	1.162	0.0792	84.16	-3.529	1.285;	merging,
238	22.88	0.03	130	3600	0.993	0.993	0.06	98.44	-4.305	1.567;	begin overlap,
300	21.25	0.03	247.1	3600	0.912	0.912	0.0325	107.3	-5.686	2.07;	
342	21.16	0.03	272.3	3600	0.909	0.909	0.0297	107.6	-6.106	2.222;	local maximum rise or fall,

4/3 Power Law. Farfield dispersion based on wastefield width of 26.10 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
1.48E-02	**137.5**	55.73	74.37	0.67	0	0	0.03	3.00E-04

count: 1 ***Worst Case Chronic***
10:53:33 AM. amb fills: 2

Winter season, peak flow rate

/ Windows UM3. 1/13/2005 10:53:38 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\Lagoon Plant\outfall analysis.001.db; Diffuser table record 3: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	-200	22.22	6.44	0	0	0.03	290	0.0003
1	0.03	-200	23.78	7.54	0	0	0.03	290	0.0003
2	0.03	-200	24.4	8.22	0	0	0.03	290	0.0003
3	0.03	-200	26.14	8.71	0	0	0.03	290	0.0003
4	0.03	-200	27.14	8.88	0	0	0.03	290	0.0003
5	0.03	-200	27.87	9.11	0	0	0.03	290	0.0003
6	0.03	-200	28.53	9.3	0	0	0.03	290	0.0003
7	0.03	-200	28.91	9.45	0	0	0.03	290	0.0003
8	0.03	-200	29.11	9.51	0	0	0.03	290	0.0003
9	0.03	-200	29.45	9.54	0	0	0.03	290	0.0003
10	0.03	-200	29.59	9.57	0	0	0.03	290	0.0003
11	0.03	-200	29.76	9.59	0	0	0.03	290	0.0003
12	0.03	-200	29.89	9.61	0	0	0.03	290	0.0003
13	0.03	-200	29.94	9.62	0	0	0.03	290	0.0003
14	0.03	-200	29.92	9.62	0	0	0.03	290	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
2.25	18	90	70	24	8	24.4	244	44	3.2	0.05	7.8	100

Froude number: 20.0

	Depth	Amb-cur	P-dia	Incrmnt	Polutnt	4/3Eddy	P-speed	Dilutn	x-posn	y-posn	
Step	(ft)	(m/s)	(in)	(s)	(ppm)	(ppm)	(m/s)	()	(ft)	(ft)	
0	44	0.03	2.25	3600	100	100	2.277	1	0	0.0;	
100	41.22	0.03	14.98	3600	13.8	13.8	0.359	7.103	-0.1	0.0364;	axial vel 0.00272
200	28.28	0.03	67.79	3600	1.905	1.905	0.127	51.33	-2.086	0.759;	axial vel 0.00636
211	25.86	0.03	81.86	3600	1.532	1.532	0.108	63.82	-2.679	0.975;	trap level,
219	24.03	0.03	96.52	3600	1.308	1.308	0.0903	74.78	-3.227	1.174;	merging,
233	21.65	0.03	139.1	3600	1.088	1.088	0.0642	89.9	-4.169	1.517;	begin overlap,
300	20.03	0.03	284.3	3600	1.015	1.015	0.0323	96.35	-5.456	1.986;	
341	19.96	0.03	311.5	3600	1.013	1.013	0.0297	**96.53**	-5.797	2.11;	local maximum rise or fall,

4/3 Power Law. Farfield dispersion based on wastefield width of 27.09 m ***Worst Case Acute***

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
1.91E-02	122.5	57.05	74.37	0.671	0	0	0.03	3.00E-04

count: 1

10:53:39 AM. amb fills: 2

Summer season, current average flow rate

/ Windows UM3. 1/13/2005 10:53:50 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\Lagoon Plant\outfall analysis.002.db; Diffuser table record 4: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	-200	25.83	13.96	0	0	0.03	290	0.0003
1	0.03	-200	25.87	13.93	0	0	0.03	290	0.0003
2	0.03	-200	26.9	13.93	0	0	0.03	290	0.0003
3	0.03	-200	27.16	13.69	0	0	0.03	290	0.0003
4	0.03	-200	27.43	13.25	0	0	0.03	290	0.0003
5	0.03	-200	27.76	12.88	0	0	0.03	290	0.0003
6	0.03	-200	28.09	12.65	0	0	0.03	290	0.0003
7	0.03	-200	28.23	12.59	0	0	0.03	290	0.0003
8	0.03	-200	28.29	12.52	0	0	0.03	290	0.0003
9	0.03	-200	28.4	12.42	0	0	0.03	290	0.0003
10	0.03	-200	28.71	12.05	0	0	0.03	290	0.0003
11	0.03	-200	28.89	11.9	0	0	0.03	290	0.0003
12	0.03	-200	28.92	11.84	0	0	0.03	290	0.0003
13	0.03	-200	28.94	11.75	0	0	0.03	290	0.0003
14	0.03	-200	29.12	11.54	0	0	0.03	290	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
2.25	18	90	70	24	8	24.4	244	44	1.3	0.05	17.5	100

Froude number: 8.099

	Depth	Amb-cur	P-dia	Incrmnt	Polutnt	4/3Eddy	P-speed	Dilutn	x-posn	y-posn	
Step	(ft)	(m/s)	(in)	(s)	(ppm)	(ppm)	(m/s)	()	(ft)	(ft)	
0	44	0.03	2.25	3600	100	100	0.925	1	0	0.0;	
100	41.48	0.03	12.61	3600	13.8	13.8	0.207	7.103	-0.172	0.0624;	
200	32.92	0.03	47.03	3600	1.905	1.905	0.108	51.32	-1.881	0.685;	
221	29.92	0.03	65.59	3600	1.257	1.257	0.0832	77.78	-2.8	1.019;	axial vel 0.0038 trap level,
243	27.39	0.03	97.2	3600	0.879	0.879	0.0543	111.2	-3.978	1.448;	merging,
246	27.19	0.03	101.5	3600	0.853	0.853	0.0519	114.7	-4.106	1.494;	begin overlap,
300	25.48	0.03	167.3	3600	0.724	0.724	0.0325	135.1	-5.894	2.145;	
342	25.28	0.03	184.4	3600	0.716	0.716	0.0298	136.6	-6.796	2.473;	local maximum rise or fall,

4/3 Power Law. Farfield dispersion based on wastefield width of 23.87 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
8.47E-03	177.6	52.74	74.37	0.668	0	0	0.03	3.00E-04

count: 1

10:53:51 AM. amb fills: 2

Summer season, design flow rate

/ Windows UM3. 1/13/2005 10:53:56 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\Lagoon Plant\outfall analysis.002.db; Diffuser table record 5: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	-200	25.83	13.96	0	0	0.03	290	0.0003
1	0.03	-200	25.87	13.93	0	0	0.03	290	0.0003
2	0.03	-200	26.9	13.93	0	0	0.03	290	0.0003
3	0.03	-200	27.16	13.69	0	0	0.03	290	0.0003
4	0.03	-200	27.43	13.25	0	0	0.03	290	0.0003
5	0.03	-200	27.76	12.88	0	0	0.03	290	0.0003
6	0.03	-200	28.09	12.65	0	0	0.03	290	0.0003
7	0.03	-200	28.23	12.59	0	0	0.03	290	0.0003
8	0.03	-200	28.29	12.52	0	0	0.03	290	0.0003
9	0.03	-200	28.4	12.42	0	0	0.03	290	0.0003
10	0.03	-200	28.71	12.05	0	0	0.03	290	0.0003
11	0.03	-200	28.89	11.9	0	0	0.03	290	0.0003
12	0.03	-200	28.92	11.84	0	0	0.03	290	0.0003
13	0.03	-200	28.94	11.75	0	0	0.03	290	0.0003
14	0.03	-200	29.12	11.54	0	0	0.03	290	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
2.25	18	90	70	24	8	24.4	244	44	2.5	0.05	17.5	100

Froude number: 15.58

	Depth	Amb-cur	P-dia	Incrmnt	Polutnt	4/3Eddy	P-speed	Dilutn	x-posn	y-posn	
Step	(ft)	(m/s)	(in)	(s)	(ppm)	(ppm)	(m/s)	()	(ft)	(ft)	
0	44	0.03	2.25	3600	100	100	1.779	1	0	0.0;	
100	41.26	0.03	14.5	3600	13.8	13.8	0.3	7.103	-0.121	0.0439;	axial vel 0.0022
200	29.63	0.03	62.26	3600	1.905	1.905	0.118	51.32	-2.048	0.745;	axial vel 0.00515
213	27.14	0.03	78.73	3600	1.473	1.473	0.0947	66.39	-2.736	0.996;	trap level,
223	25.14	0.03	96.04	3600	1.208	1.208	0.0773	80.93	-3.438	1.251;	merging,
242	22.19	0.03	150.4	3600	0.932	0.932	0.0537	105	-4.888	1.779;	begin overlap,
300	20.21	0.03	269.3	3600	0.842	0.842	0.0322	116.1	-6.829	2.485;	
340	20.06	0.03	294.2	3600	0.838	0.838	0.0297	116.6	-7.521	2.738;	local maximum rise or fall,

4/3 Power Law. Farfield dispersion based on wastefield width of 26.65 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
1.30E-02	148.2	56.23	74.37	0.666	0	0	0.03	3.00E-04

count: 1

10:53:57 AM. amb fills: 2

Summer season, peak flow rate

/ Windows UM3. 1/13/2005 10:54:03 AM

Case 1; ambient file Z:\WWTP\Oak Harbor\Lagoon Plant\outfall analysis.002.db; Diffuser table record 6: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0	0.03	-200	25.83	13.96	0	0	0.03	290	0.0003
1	0.03	-200	25.87	13.93	0	0	0.03	290	0.0003
2	0.03	-200	26.9	13.93	0	0	0.03	290	0.0003
3	0.03	-200	27.16	13.69	0	0	0.03	290	0.0003
4	0.03	-200	27.43	13.25	0	0	0.03	290	0.0003
5	0.03	-200	27.76	12.88	0	0	0.03	290	0.0003
6	0.03	-200	28.09	12.65	0	0	0.03	290	0.0003
7	0.03	-200	28.23	12.59	0	0	0.03	290	0.0003
8	0.03	-200	28.29	12.52	0	0	0.03	290	0.0003
9	0.03	-200	28.4	12.42	0	0	0.03	290	0.0003
10	0.03	-200	28.71	12.05	0	0	0.03	290	0.0003
11	0.03	-200	28.89	11.9	0	0	0.03	290	0.0003
12	0.03	-200	28.92	11.84	0	0	0.03	290	0.0003
13	0.03	-200	28.94	11.75	0	0	0.03	290	0.0003
14	0.03	-200	29.12	11.54	0	0	0.03	290	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(in)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(ppm)
2.25	18	90	70	24	8	24.4	244	44	3.2	0.05	17.5	100

Froude number: 19.94

	Depth	Amb-cur	P-dia	Incrmnt	Polutnt	4/3Eddy	P-speed	Dilutn	x-posn	y-posn	
Step	(ft)	(m/s)	(in)	(s)	(ppm)	(ppm)	(m/s)	()	(ft)	(ft)	
0	44	0.03	2.25	3600	100	100	2.277	1	0	0.0;	
100	41.22	0.03	14.98	3600	13.8	13.8	0.36	7.103	-0.1	0.0364;	axial vel 0.00272
200	28.31	0.03	69.3	3600	1.905	1.905	0.121	51.33	-2.081	0.757;	axial vel 0.00619
211	25.93	0.03	84.56	3600	1.532	1.532	0.101	63.82	-2.706	0.985;	trap level,
218	24.34	0.03	96.85	3600	1.334	1.334	0.0883	73.31	-3.203	1.166;	merging,
237	20.44	0.03	160.7	3600	1.004	1.004	0.0588	97.42	-4.85	1.765;	begin overlap,
300	18.46	0.03	312.7	3600	0.923	0.923	0.0322	106	-6.55	2.384;	
340	18.37	0.03	341.6	3600	0.921	0.921	0.0297	106.2	-6.999	2.547;	local maximum rise or fall,

4/3 Power Law. Farfield dispersion based on wastefield width of 27.86 m

conc	dilutn	width	distnce	time				
(ppm)		(m)	(m)	(hrs)	(ppm)	(s-1)	(m/s)	(m0.67/s2)
1.64E-02	134	57.85	74.37	0.668	0	0	0.03	3.00E-04

count: 1

10:54:05 AM. amb fills: 2

APPENDIX I—EFFLUENT TESTING DATA

Effluent analyses for conventional, metallic and toxic pollutants were conducted by Avocent Environmental Testing. The following tables summarize the concentrations of pollutants found in the effluents of both facilities.

Discharge #001, RBC Plant Conventional Pollutants

	Reported Values (mg/L)						
Test Date	Nitrate+ Nitrite-N	DO	TDS	Hardness	T. Phosphorus	TKN	Oil & Grease
4/16/2003	5.7	4.6	300	74	3.14	16.1	ND
6/26/2002	5.1	NR	300	NR	4	20.6	ND
4/11/2001	4.2	NR	510	NR	2.7	17.1	ND
Average	5.0	4.6	370.0	74.0	3.3	17.9	ND
Max	5.7	4.6	510	74	4	20.6	ND

Discharge #002, Lagoon Facility Conventional Pollutants

	Reported Values (mg/L)						
Test Date	Nitrate+ Nitrite-N	DO	TDS	Hardness	T. Phosphorus	TKN	Oil & Grease
4/16/2003	0.7	10.3	340	80	4.08	30.2	5
6/26/2002	2.8	NR	360	NR	5.9	38	ND
4/11/2001	1.9	NR	360	88	2.9	25.1	ND
Average	1.8	10.3	353.3	84.0	4.3	31.1	5.0
Max	2.8	10.3	360	88	5.9	38	5

Discharge #002, Lagoon Facility Metals and Toxic Pollutants

	Reported Values (µg/L)									
Test Date	Copper	Lead	Zinc	Bis (2-ethylhexyl) phthalate	Acetone	Methylene Chloride	Chloroform	Methyl ethyl ketone	Phenols	Cyanide
4/16/2003	12	ND	ND	ND	ND	ND	1	3.9	NR	ND
6/26/2002	21	1	50	9.5	5	3.6	ND	ND	ND	ND
4/11/2001	10	ND	40	ND	NR	NR	NR	NR	ND	ND
Average	14.3	1.0	45.0	9.5	5.0	3.6	1.0	3.9	ND	ND
Max	21	1	50	9.5	5	3.6	1	3.9	ND	ND

ND = Not Detected Above Practical Quantitation Limit
NR = Not Reported

APPENDIX J—REASONABLE POTENTIAL ANALYSIS FOR WATER QUALITY CRITERIA

Evaluating the need for water quality-based discharged limits is based on an analysis of the reasonable potential for the effluent to exceed water quality criteria as outlined in EPA's *Technical Support Document for Water Quality-based Toxics Control* (EPA/505/2-90-001, 1991). Criteria used in the analysis were taken from 173-201A WAC and are listed in the following table of pollutants of concern found in the Permittee's outfall(s).

WATER QUALITY CRITERIA (in ug/L unless otherwise noted)

	PRIORITY	CARCIN	Water Quality Criteria				Human Health Criteria		Organoleptic Effects	Metals Translators			
			Fresh		Marine		Fresh	Marine		Freshwater		Marine	
Pollutant, CAS No. & Application Ref. No.	PLTNT?	GEN?	acute	chronic	acute	chronic				Acute	Chronic	Acute	Chronic
CHLORINE (Total Residual) 7782505	N	N	19	11	13	7.5							
AMMONIA Total as NH3-N	N	N	*See separate sheets for criteria calculattions*										
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	Y	Y					1.8	5.9					
METHYLENE CHLORIDE 75092 22V	Y	Y					4.7	1600					
CHLOROFORM 67663 11V	Y	Y					5.7	470					
COPPER - 744058 6M Hardness dependent	Y	N	4.6	3.5	4.8	3.1			1000	0.996	0.996	0.83	0.83
ZINC- 7440666 13M hardness dependent	Y	N	35.4	32.3	90	81			5000	0.996	0.996	0.946	0.946

Calculated data used in evaluating the reasonable potential for water quality exceedance can be found in the following tables, along with the derivation of limits for chlorine. All calculations were made using Ecology's TSDCALC11 and PWSPREAD spreadsheets, which are available at the following web site: http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html.

Calculation of seawater fraction of un-ionized ammonia -- RBC Plant
from Hampson (1977). Un-ionized ammonia criteria for
salt water are from EPA 440/5-88-004.

Based on Lotus File NH3SALT.WK1 Revised 19-Oct-93

INPUT	
1. Temperature (deg C):	9.4
2. pH:	8.3
3. Salinity (g/Kg):	26.7
OUTPUT	
1. Pressure (atm; EPA criteria assumes 1 atm):	1.0
2. Molal Ionic Strength (not valid if >0.85):	0.547
3. pKa8 at 25 deg C (Whitfield model "B"):	9.308
4. Percent of Total Ammonia Present as Unionized:	2.971%
5. Unionized ammonia criteria (mg un-ionized NH3 per liter) from EPA 440/5-88-004	
Acute:	0.233
Chronic:	0.035
6. Total Ammonia Criteria (mg/L as NH3)	
Acute:	7.84
Chronic:	1.18
7. Total Ammonia Criteria (mg/L as NH3-N)	
Acute:	**6.45**
Chronic:	**0.97**

Calculation of seawater fraction of un-ionized ammonia -- Lagoon Facility
from Hampson (1977). Un-ionized ammonia criteria for
salt water are from EPA 440/5-88-004.

Based on Lotus File NH3SALT.WK1 Revised 19-Oct-93

INPUT	
1. Temperature (deg C):	9.6
2. pH:	8.3
3. Salinity (g/Kg):	29.9
OUTPUT	
1. Pressure (atm; EPA criteria assumes 1 atm):	1.0
2. Molal Ionic Strength (not valid if >0.85):	0.615
3. pKa8 at 25 deg C (Whitfield model "B"):	9.316
4. Percent of Total Ammonia Present as Unionized:	2.962%
5. Unionized ammonia criteria (mg un-ionized NH3 per liter) from EPA 440/5-88-004	
Acute:	0.233
Chronic:	0.035
6. Total Ammonia Criteria (mg/L as NH3)	
Acute:	7.87
Chronic:	1.18
7. Total Ammonia Criteria (mg/L as NH3-N)	
Acute:	**6.47**
Chronic:	**0.97**

Reasonable Potential Analysis for Water Quality Criteria

RBC Plant, Outfall #001

Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) *ug/L*	State Water Quality Standard		Max concentration at edge of...		**LIMIT REQ'D?**	CALCULATIONS									
				Acute *ug/L*	Chronic *ug/L*	Acute Mixing Zone *ug/L*	Chronic Mixing Zone *ug/L*		Effluent percentile value	*Pn*	Max effluent conc. measured (metals as total recoverable) *ug/L*	Coeff Variation *CV*	*s*	# of samples *n*	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
CHLORINE (Total Residual) 7782505				13.00	7.50	17.94	6.82	YES	0.95	0.652	170.00	0.60	0.55	7	2.01	19	50	
AMMONIA Total as NH3-N				6450.00	970.00	2059.09	782.45	NO	0.95	0.924	34800.00	0.60	0.55	38	1.12	19	50	
COPPER - 744058 6M Hardness dependent	0.83	0.83	0.0000	4.80	3.10	2.75	1.05	NO	0.95	0.368	21.00	0.60	0.55	3	3.00	19	50	Data from outfall #002 used to evaluate potential
ZINC- 7440666 13M hardness dependent	0.95	0.95	0.0000	90.00	81.00	7.47	2.84	NO	0.95	0.368	50.00	0.60	0.55	3	3.00	19	50	Data from outfall #002 used to evaluate potential

Lagoon Facility, Outfall #002

Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) *ug/L*	State Water Quality Standard		Max concentration at edge of...		**LIMIT REQ'D?**	CALCULATIONS									
				Acute *ug/L*	Chronic *ug/L*	Acute Mixing Zone *ug/L*	Chronic Mixing Zone *ug/L*		Effluent percentile value	*Pn*	Max effluent conc. measured (metals as total recoverable) *ug/L*	Coeff Variation *CV*	*s*	# of samples *n*	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
CHLORINE (Total Residual) 7782505				13.00	7.50	14.68	10.32	YES	0.95	0.652	710.00	0.60	0.55	7	2.01	97	138	
AMMONIA Total as NH3-N				6470.00	970.00	647.87	455.39	NO	0.95	0.924	55900.00	0.60	0.55	38	1.12	97	138	
COPPER - 744058 6M Hardness dependent	0.83	0.83	0.0000	4.80	3.10	0.54	0.38	NO	0.95	0.368	21.00	0.60	0.55	3	3.00	97	138	
ZINC- 7440666 13M hardness dependent	0.95	0.95	0.0000	90.00	81.00	1.46	1.03	NO	0.95	0.368	50.00	0.60	0.55	3	3.00	97	138	

Water Qulaity Based Limit Calculations

PARAMETER	Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone. **Permit Limit Calculation Summary**										**Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations**							**Statistical variables for permit limit calculation**				
	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Ambient Concentration *ug/L*	Water Quality Standard Acute *ug/L*	Water Quality Standard Chronic *ug/L*	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments	WLA Acute *ug/L*	WLA Chronic *ug/L*	LTA Acute *ug/L*	LTA Chronic *ug/L*	LTA Coeff. Var. (CV) *decimal*	LTA Prob'y Basis *decimal*	Limiting LTA *ug/L*	Coeff. Var. (CV) *decimal*	AML Prob'y Basis *decimal*	MDL Prob'y Basis *decimal*	# of Samples per Month *n*	
RBC Plant, #001																						
CHLORINE (Total Residual) 7782505	19.0	50.0	0.95	0.95	0.00	13.00	7.50	**130.1**	**261.1**		247	375.00	79.3	197.8	0.60	0.99	79.3	0.60	0.95	0.99	4.00	0.95
Lagoon Facility, #002																						
CHLORINE (Total Residual) 7782505	97.0	138.0	N/A	N/A	0.00	13.00	7.50	**664.4**	**1333.0**		1261	1035.00	404.9	545.9	0.60	0.99	404.9	0.60	0.95	0.99	4.00	0.95

APPENDIX K—HUMAN HEALTH ANALYSIS

Water quality standards include 91 numeric human health-based criteria that must be considered when drafting an NPDES permit. Effluent testing revealed the presence of the following substances for which human health criteria has been established: bis(2-ethylhexyl)phthalate, methylene chloride, chloroform. An analysis of reasonable potential to exceed human health-based criteria at the boundaries of the chronic mixing zones was performed for these substances using TSDCALC11. No reasonable potential for exceedance was found and, therefore, no human health-based limits are set. Results of that analysis are shown in the following table.

Evaluation of Human Health Criteria Exceedence

Parameter	Ambient Concentration (Geometric Mean) *ug/L*	Water Quality Criteria for Protection of Human Health *ug/L*	Max concentration at edge of chronic mixing zone. *ug/L*	**LIMIT REQ'D?**	**Expected Number of Compliance Samples per Month**	**AVERAGE MONTHLY EFFLUENT LIMIT** *ug/L*	**MAXIMUM DAILY EFFLUENT LIMIT** *ug/L*
Lagoon Facility Outfall, #002							
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B		5.90	0.08	**NO**		**NONE**	**NONE**
METHYLENE CHLORIDE 75092 22V		1600.00	0.03	**NO**		**NONE**	**NONE**
CHLOROFORM 67663 11V		470.00	0.01	**NO**		**NONE**	**NONE**
RBC Plant Outfall, #001 (evaluated using data from Outfall #002)							
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B		5.90	0.23	**NO**		**NONE**	**NONE**
METHYLENE CHLORIDE 75092 22V		1600.00	0.09	**NO**		**NONE**	**NONE**
CHLOROFORM 67663 11V		470.00	0.02	**NO**		**NONE**	**NONE**

Parameter	Estimated Percentile at 95% Confidence	*Pn*	Max effluent conc. measured *ug/L*	Coeff Variation *CV*	**S**	# of samples *n*	Multiplier	Dilution Factor
Lagoon Facility Outfall, #002								
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	0.50	0.37	9.5	0.60	0.6	3	1.20	138.0
METHYLENE CHLORIDE 75092 22V	0.50	0.37	3.6	0.60	0.6	3	1.20	138.0
CHLOROFORM 67663 11V	0.50	0.37	1	0.60	0.6	3	1.20	138.0
RBC Plant Outfall, #001 (evaluated using data from Outfall #002)								
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	0.50	0.37	9.5	0.60	0.6	3	1.20	50.0
METHYLENE CHLORIDE 75092 22V	0.50	0.37	3.6	0.60	0.6	3	1.20	50.0
CHLOROFORM 67663 11V	0.50	0.37	1	0.60	0.6	3	1.20	50.0

APPENDIX L—EPA "PART D" NPDES APPLICATION TESTING REQUIREMENTS

Results of effluent testing for the following compounds will be required to be submitted with the Permittee's next application for permit renewal. Testing will only be required for Outfall #002.

METALS AND MISC.

Antimony
Arsenic
Beryllium
Cadmium
Chromium
Chromium +6, Dissolved
Copper
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc
Cyanide (total)
Total Phenolic Compounds
Hardness (as CaCO3)

VOLATILE COMPOUNDS

Acrolein
Acrylonitrile
Benzene
Bromoform
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-Chloroethyl vinyl ether
Chloroform
Dichlorobromomethane
1,1-Dichloroethane
Trans-1,2-Dichloroethylene
1,1-Dichloropropane
Ethylbenzene

VOLATILE COMPOUNDS CONT.

Methyl Bromide
Methyl Chloride
Methylene Chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Vinyl Chloride

ACID COMPOUNDS

P-Chloro-M-Cresol
2-Chlorophenol
2,4-Dimethylphenol
4,6-Dinitro-O-Cresol
2,4-Dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
2,4,6-Trichlorophenol

BASE/NEUTRAL COMPOUNDS

Acenaphthene
Acenaphthylene
Anthracene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
3,4-Benzofluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Bis(2-chloroethoxy) methane
Bis(2-chloroethyl) ether

BASE/NEUTRAL COMPOUNDS CONT.

Bis(2-Ethylhexyl) Phthalate
4-Bromophenyl phenyl ether
Butyl benzyl Phthalate
2-Chloronapthalene
4-Chlorophenyl phenyl ether
Chrysene
Di-n-Butyl Phthalate
Di-n-octyl Phthalate
Dibenzo (a,h) anthracene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
Diethyl Phthalate
Dimethyl Phthalate
2,4-Dinitrotoluene
2,6-Dinitrotoluene
1,2-Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno (1,2,3-cd) pyrene
Isophorone
Naphthalene
Nitrobenzene
N-nitrosodi-n-propylamine
N-nitrosodimethylamine
N-nitrosodiphenylamine
Phenanthrene
Pyrene
1,2,4-Trichlorobenzene